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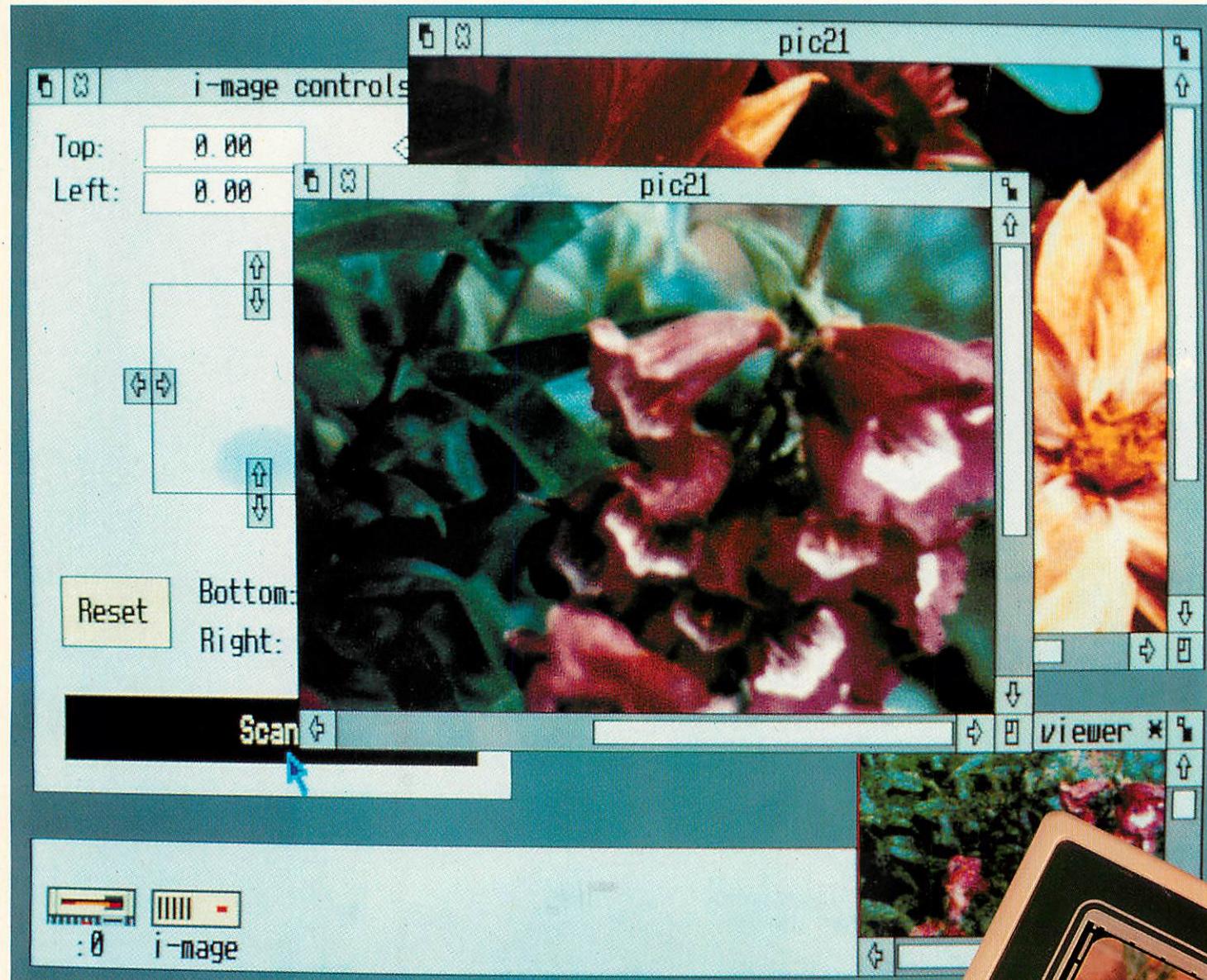
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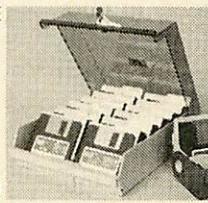
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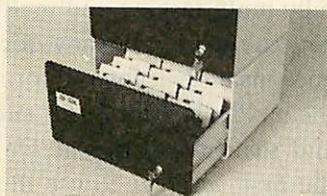
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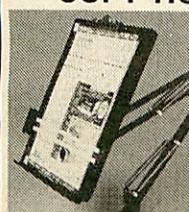
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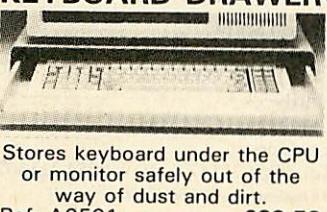
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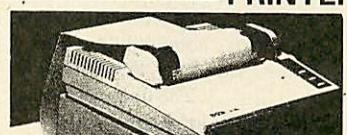
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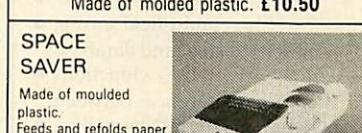
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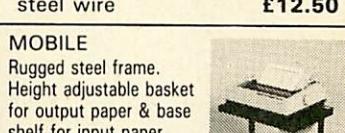
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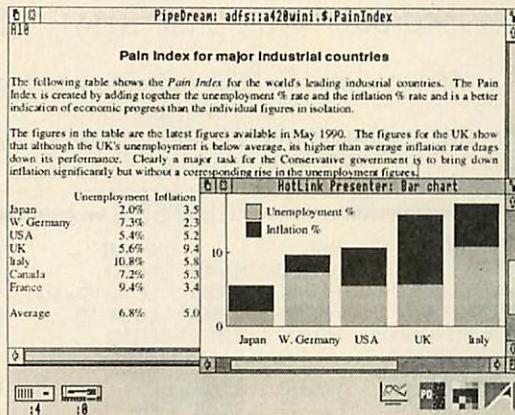
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The bar chart in the screen shown above was produced by using the HotLink between PipeDream 3 and HotLink Presenter.

Major features include:

- intuitive RISC OS user interface
- many documents loaded at once
- display and printing of pictures within text
- wysiwyg display including all RISC OS fonts
- built-in 93,003 word spelling checker
- file compatibility with PC & Z88 PipeDream & BBC View Professional
- natural, background recalculation
- keystroke compatibility with Z88 & PC PipeDream
- Z88 filing system
- automatic loading of VIEW, ViewSheet, Lotus, First Word Plus, Tab and CSV files
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- multi-field sorting
- 62 spreadsheet and database functions
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- macro file recorder
- slot protection

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software

PipeDream 3 breaks down the barriers between word processor, spreadsheet and database. With PipeDream 3, you can include numerical tables in your letters and reports, add paragraphs to your spreadsheets, and perform calculations within your databases.

PipeDream 3 has been written to take full advantage of RISC OS – if you can use RISC OS, you can use PipeDream 3. It is fully multi-tasking and multi-windowing, so you can work on many documents at once and instantly move information between them. PipeDream 3 can automatically load and save most popular file formats and is the first program to use the new RISC OS HotLink, which enables it to interact dynamically with Archimedes graphics programs, such as *HotLink Presenter* from Lingenuity and *GraphBox* from Minerva.

As well as winning the 1989/90 BBC Acorn User Award for Best 32-bit Business Software, PipeDream 3 was runner-up in the Best 32-bit Educational Software and Best 32-bit DTP/Word Processor categories.

PipeDream 3
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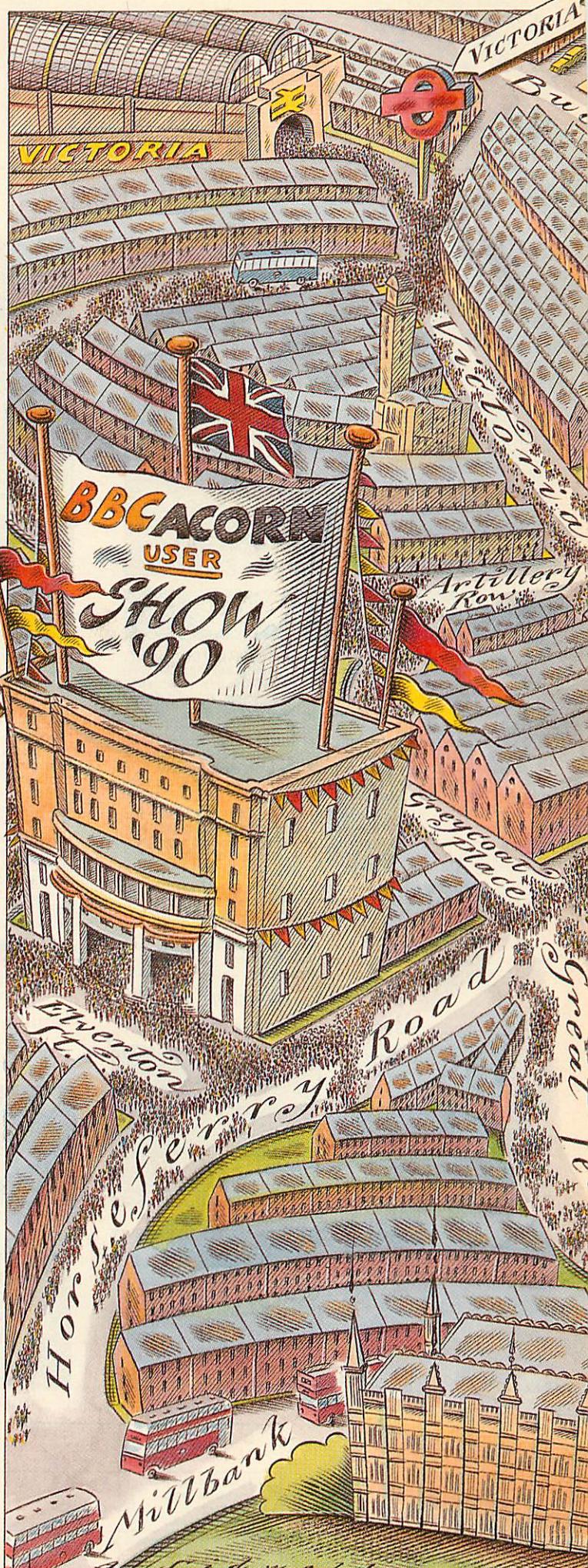
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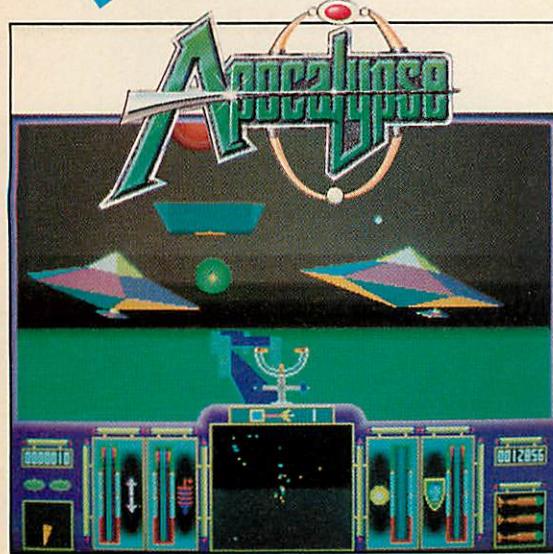
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**A3000
ARCHIMEDES
BBC B/MASTER
ELECTRON**

THE 4TH



APOCALYPSE

Apocalypse is designed purely for the Archimedes. Utilising the machine's colossal processing power combined with ingenious programming techniques, the author has created a masterpiece which could not have been produced on any other home computer. The author is of course Gordon Key who already has Holed Out and E-Type under his belt. Apocalypse is by far his best work to date.

The game places you on the surfaces of varied futuristic hostile planets colonised by ruthless enemies. With your highly advanced craft you must find your way around the planets and systematically annihilate the enemy. Your ship, which can fly or move along the ground, is extremely fast and can even fight whilst hurtling backwards.

The graphics are truly unbelievable. The solid, shaded 3 dimensional buildings and objects are animated more quickly and smoothly than ever before. If you shoot at them they explode in a way that is terrifyingly real often catching fire before bursting into a ball of flames accompanied by devastating sound effects.

Initially Apocalypse is easy enough for a beginner to enjoy but as you progress your foes will become increasingly hostile and you will discover fascinating new objects. These can have strange properties and many may need to be destroyed. It will be up to you to discover how.

The Royal Guild of Spacing will monitor your progress as you play. Your performance will be assessed at appropriate times and you will need to impress them if you are to continue your adventure. Apocalypse is an amazing game. There's only one way to describe it....

RAW EXCITEMENT.

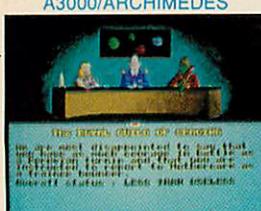
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The Fourth Dimension



INERTIA

Inertia is a totally original game with a huge landscape just waiting to be explored. It is available for the Archimedes, BBC Micro and Acorn Electron. Scattered (or rather fiendishly placed) around the landscape are many special tiles which need to be collected. Your highly sensitive craft floats freely around the landscape and you must exert forces upon it to guide its speed and direction.

You have a 3 dimensional viewpoint displaying a tiny fraction of the total playing area. There are walls, bridges, tunnels and ramps to negotiate and a host of mystery tiles with strange properties indeed. These include ice, jump and transformation tiles. There are even certain tiles which alternate the controls so that everything works in reverse.

This massive game has been very carefully put together and solving the puzzles within it will need lateral thought and a lot of dexterity.

The Archimedes version is considerably enhanced with digitised sound and music. It even features a full colour 3 dimensional map of the game which is a joy just to wander around. You'll certainly be amazed at the size of the game and the variety within it.

Inertia is a game for the determined. Each version makes full use of the ability of the computer so make sure you've got plenty of time to spare. Once you have started you won't be able to stop.

Electron User Golden Game May'90

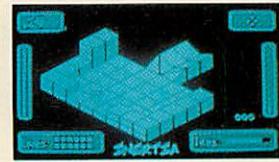
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BBC B/MASTER



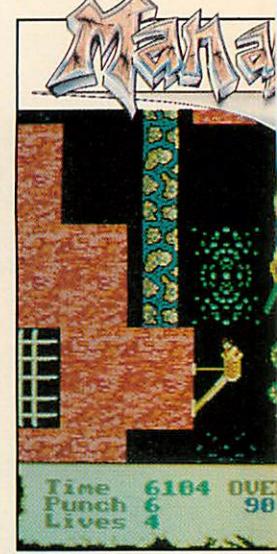
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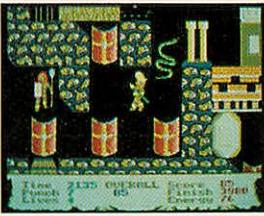
MAN-A

In the age when the castle was supreme it took dedicated warriors to overcome their defences, to loot and pillage, and finally to destroy.

You are armed with a mighty sword cast from the remains of a thunderbolt which fell from the sky many millennia ago. Also in your possession is a magic potion which makes you invincible to all for short periods of time. Armed with these you must penetrate the inner recesses of 4 castles and do battle with all you find in them.

As you progress you will discover many intriguing objects which can behave very strangely. Many are documented such as wooden panels, hour glasses, thorns, portcullis, mirrors etc.. But most are

PRICE: A3000/



A3000/ARCHIMEDES



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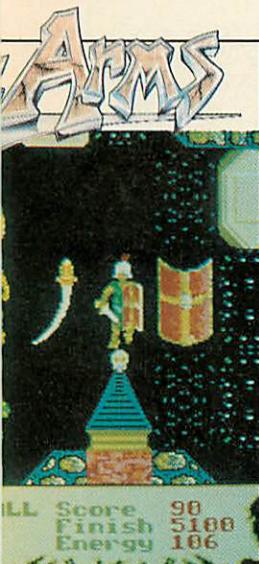
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DIMENSION

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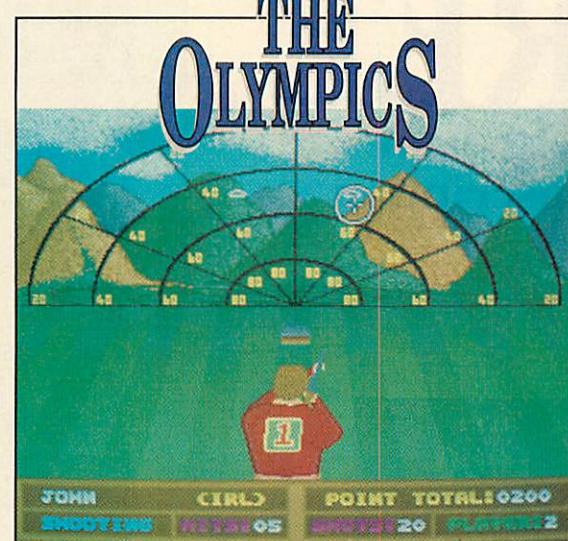


MAN-AT-ARMS

not. When you think you're stuck, experiment and you'll discover properties you never knew existed.

The subtle blend of arcade timing and adventurous puzzles make Man-At-Arms fiendishly addictive. You must plunder each of the 4 castles which become increasingly "puzzling" as you progress. Your overall objective is to kill all foes with your mighty sword and to plunder as much of the most valuable treasure as you can carry.

Man-At-Arms is a fascinating challenge with superb sound effects and music. No attention to detail has been spared and you can be sure of many late nights for weeks to come.

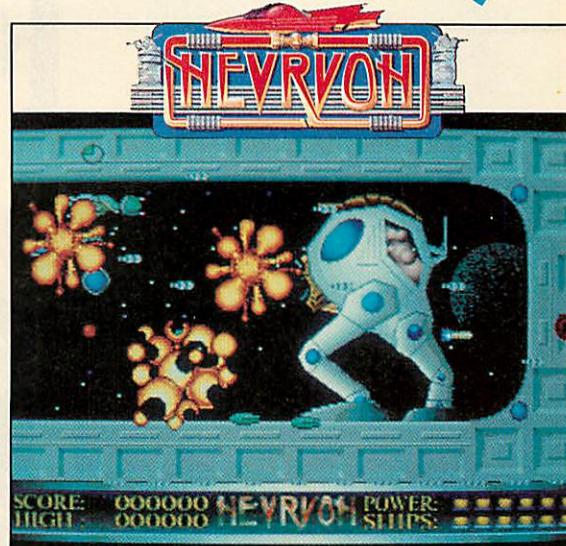


THE OLYMPICS

The Olympics is an experience which can be played by 1 to 8 players. It contains a superb piece of music, opening and closing ceremonies and 14 national anthems. When a player wins a gold medal the national anthem for his chosen country is played. Any World Records that you achieve can be saved to disc. With the click of a button all the relevant information concerning the record is automatically saved including your name, the exact time, day and date!

It is comprised of 6 main events: Diving, Shooting, Javelin, Swimming, Canoeing and Pole Vault. Some of these have several "sub-events" to choose from - there are 2 Shooting events, 12 Swimming events and 3 Canoeing events. These events have been chosen for maximum variety and enjoyment. They will "extract" all sorts of abilities: manual dexterity, timing, memory, perseverance, adaptability and above all guts!

The menu systems are controlled entirely with the mouse. As such they are extremely easy and quick to use. All events can be practised or competed in individually, or altogether for maximum Gold, Silver and Bronze medals. You can also play all 6 events as a sort of "hexathlon" where points are awarded for each event - the player with the greatest number of points is deemed to be the winner.



NEVRYON

This fast arcade game is disc based only and boasts 100K of graphics and game code for the BBC and 2 discs of over 1.5 megabytes for the Archimedes. It is a fast sideways scrolling shoot'em up which features 8 levels of furious opponents and very varied and very detailed graphics.

You fly a spaceship which can attain immense firepower - more lasers, a ram, gun droids and highly destructive missiles which are released from the top & bottom of your ship, then ignite and shoot forwards.

Whilst the BBC version is superb, the Archimedes version has been considerably enhanced and is truly exceptional putting many arcade games to shame. Nevryon uses the machine's raw power to full effect and gameplay is second to none.

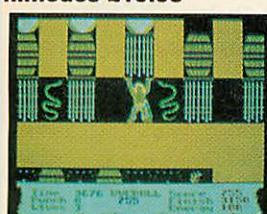
It comes on 2 discs and features 5 true levels of parallax scrolling, more than 50 objects on screen, over 1 megabyte of 256 colour graphics, digitised stereo sound and music etc. etc.. You control a different ship on each of the 4 scenarios and there are a seemingly infinite number of weapons to collect and use. End of level monsters are beautifully animated but are anything but friendly.

BBC Review: "Graphics are very colourful and hectic, with explosions, missiles and aliens all heading for your ship. Together with a scrolling landscape, complete with stars moving in the background, they combine to form an enjoyable and action packed game." Micronet, Feb'90.

BBC Micro version available **NOW**.
Enhanced Archimedes version available in June, 1990.

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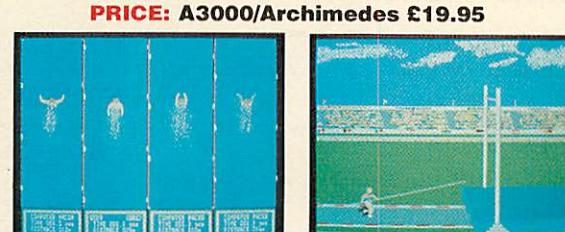
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RISC User

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Technical queries and expert answers

The programs published in each magazine, plus additional bonus items are also available on disc.

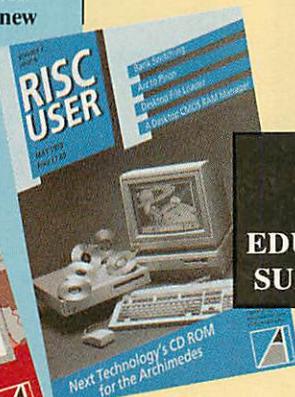
And here are some of the articles and series you missed in the last few months:

Mastering the Wimp – series on Wimp programming
Beginning 'C' – series on the C language
Assembler Workshop – all about ARM Assembler
Under the Lid – hardware series
CD ROM for the Archimedes
Watchdog Anti-virus
Using Draw Files in Basic
Desktop File Loader
Review of Multi-sync Monitors
Scanners for the Arc
PSION and Z88 to Arc
Into the Arc – series for beginners
Arcade – latest games for the Arc

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Postbag with answers to your questions
Hints and tips on programming

The magazine programs, plus some bonus items are also available on disc.

These are some of the items published in the last few issues:

First Course – beginners series of articles
Practical Assembler – series for Assembly language programmers
512 Forum – a series for users of the PC emulator
Edikit – a library of useful routines for Basic programmers
BEEBUG Education
Upgrading to an Archimedes
ADFS Desktop
Music Programming in Ample
Writing a compiler
Using the ROM Filing System
Curve Fitting
Games Reviews

R&D MAN QUILTS

Steve Furber – who, with Roger Wilson, developed and engineered the Arm chip set – is to leave Acorn this month. He is due to take up a new appointment – the ICL Chair of Computer Engineering at Manchester University.

Furber and Wilson's work on the Arm chip set forms the basis of the current Acorn range.

Furber's departure from Acorn could affect the company's R&D activity, at least in the short term. And since Furber will be taking his knowledge in Arm with him, might we see further Arm-type developments outside the Acorn arena?

SPREAD THE WORD

Schema is a new spreadsheet software package currently being developed by Acorn for the Archimedes and A3000.

It is a Risc OS multi-tasking application with advanced statistical and financial features, using a Wysiwyg display. *Schema* can be tailored for individual needs by using a macro support facility.

Spreadsheet size is 32,000 columns by 32,000 rows. Multiple spreadsheets can be linked together, and functions for graphs and charts will be included. Printer support with draft and final copy is allowed, and all standard Risc OS printer drivers are also supported.

The price is to be announced.

NEW ARC PLANNED

Acorn is thought to be working on an Arm 3-based machine which will sit at the top of the Archimedes range.

The new machine's model number is yet to be announced, but it is believed it may be available later this year.

It will be equipped with an Arm 3 chip running at 30Mhz. The chip would operate at between 10 and 12 MIPS – that is three times faster than the current Archimedes machines.

The machine will come with 4Mb of fast Ram, a large internal hard disc, a single floppy drive, video options, larger PSU and a SCSI controller as standard, leaving three free slots.

No price has yet been fixed, but we believe that the machine will probably cost £1000 more than the A440.

It will be possible to expand on-board memory up to 16Mb with 4Mb memory expansion cards that are fitted with a Memc 1A memory controller chip.

The motherboard will incorporate a CPU slot, and Acorn is also working on a plug-in Arm/floating-point unit board, which



should be available with a possible rating of 50Mhz. The machine will have some similarities to the hardware specification for the R260 Unix workstation, launched in June.

The casing will be the same as the 400 series, but with a new motherboard with two

thermostatically controlled fans.

The new computer is intended by Acorn to be the first in a series of Arm 3-based Archimedes machines.

No further details are available yet, but a similar machine without the hard disc could be a logical successor.

COMPUTER MISUSE ILLEGAL

The Computer Misuse Bill has become law. Unauthorised access to computer systems will now become a criminal offence, which will be punishable by



either imprisonment or fines.

According to Michael Colvin, the MP responsible for sponsoring the Bill, the new laws will 'bring Britain in line with the rest of Europe, where legislation to deal with hackers has already been implemented.'

The laws will come into effect on August 29. Three new criminal offences are covered:

- unauthorised access to computer material.
- unauthorised access with in-

tent to commit or facilitate further offences.

- unauthorised modification of computer material.

The first type of offence covers 'simple hacking' and carries a fine of up to £2000. The second covers actions such as blackmail, with a penalty of up to five years in jail. The third type of offence carries the same penalty.

The latter two offences will be tried in front of a jury.



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* The Multi Sync Monitor is the Taxan 775

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ARC CD ROM

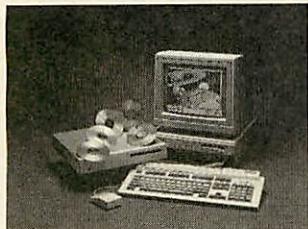
The Next CD-Rom drive system for the Archimedes and A3000 which was shown for the first time at BETT 90 last January, is now on sale.

Developed by Acorn and Cambridge-based Next Technology, the system costs £1144, or £914 for educational orders.

The complete package includes the drive, CD interface card with cabling, CDFS software for Risc OS and documentation. The drive is also supplied with a sample resource disc included.

Each system will also come with a £50 voucher which can be traded against Next Technology's 'Pressed for Time' disc pressing service. The facility allows users to generate a single CD-Rom for £170.

Contact Next Technology on (0223) 421180.



ACORN PROPS UP MODEL B

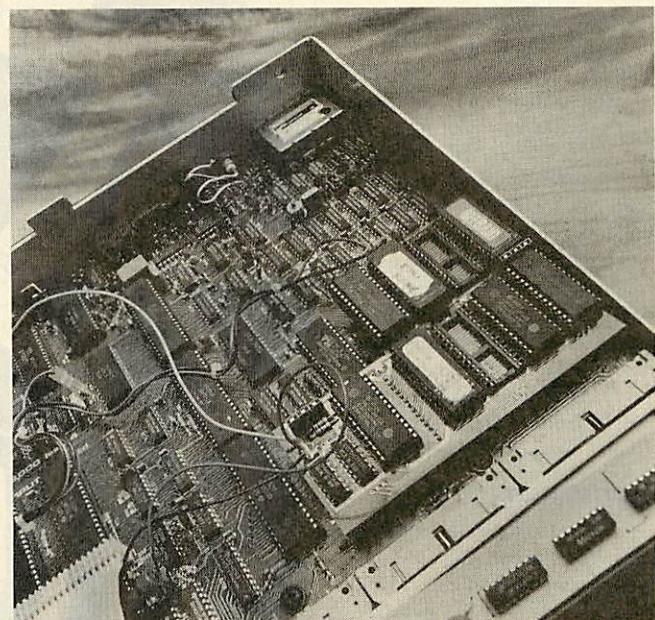
Acorn Computers has committed itself to supporting the BBC model B 'while the requirement for the machine exists'.

Acorn says it has recognised that even though the BBC model B is no longer in production, it needs to support the machine for some time to come because it is so firmly established.

The company intends to supply, through its dealers, all major parts for the Beeb, including power supplies, Roms and ICs for at least two years.

The exceptions are model B keyboards and keyswitches. According to Acorn these items have become increasingly difficult to obtain, and there are limited stocks available.

In order to ensure that model B keyboards can be maintained, Acorn has organised a centralised repair, refurbishment and exchange service, run by Bedford Technical Engineering.



Acorn itself has now ceased selling keyboards and keyboard parts directly to dealers.

Users wishing to have their

keyboards repaired should contact their local Acorn dealer, who will be able to offer a repair or replacement service.

MORE FOUNDRY FONTS

The Electronic Font Foundry has agreed with the Postscript specifier, Adobe, to match the relevant Postscript fonts. It has already converted 13 of its fonts so far. The rest will follow over the next three months.

Electronic Font Foundry

are available as separate font families, ranging from £9.95 to £33, or as font packs of up to 17 fonts from £45 to £69.

• The Electronic Font Foundry has also released 17 'designer' fonts 'to give a creative option to Archimedes DTP users'.

Oxford Optima

Poster Bodoni Poster

Royal ITC Souvenir

Sophie Park Avenue

Sulikow ITC Bauhaus

Swiss Helvetica

Tamsin Brush Script

EFF_Times Times

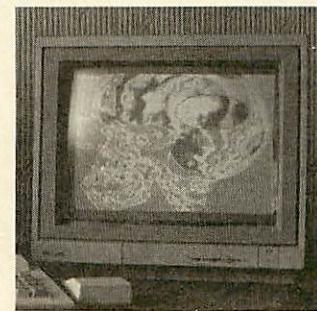
IMAGE ANALYSIS

Foster Findlay Associates has released *Arcimage*, a suite of interactive image processing and analysis software for the Archimedes. The company has also released a set of C function libraries for the Arc.

Both sets of code are configured to work with the Hawk V10 framestore from Wild Vision, which plugs into the Arc.

Arcimage is a standalone image processing and analysis suite that provides icon-selectable functions for a wide range of applications.

C Image is a software toolkit designed for more complex applications. 200 functions are currently available with exten-



BBC ACORN

USER
SHOW
'90

JOIN IN THE FUN

The BBC Acorn User Show 90 is the place to be. As a Beeb or Arc owner, you can join fellow enthusiasts at the show, which takes place at London's Westminster Exhibition Centre (see map) on September 7-9.

Besides good company, you will find all the latest products for your micro, many of them at special show prices. Keep a special look-out for discounts from Clares, Watford Electronics, Beebug, Pineapple Software, and many more.

There will be numerous demonstrations held on exhibitors' stands, and they will be very pleased to answer any questions you may have concerning particular products. In fact, the show provides the perfect opportunity for you to 'try before you buy'.

To help you get to the exhibition, there will be a luxury coach travelling every 20 minutes from Victoria train station (take the Wilton Road exit).

Opening times of the show are 12 noon - 7pm (Fri) and 10am - 6pm (Sat and Sun).

SEMINAR DETAILS

Among the major attractions at past BBC Acorn User Shows have been the seminars. Held by key figures in the industry, they give you the opportunity to keep up with the latest developments and techniques. Below is a brief résumé of the seminars, but you are advised to check the show catalogue, as details are subject to change.

Friday, September 7

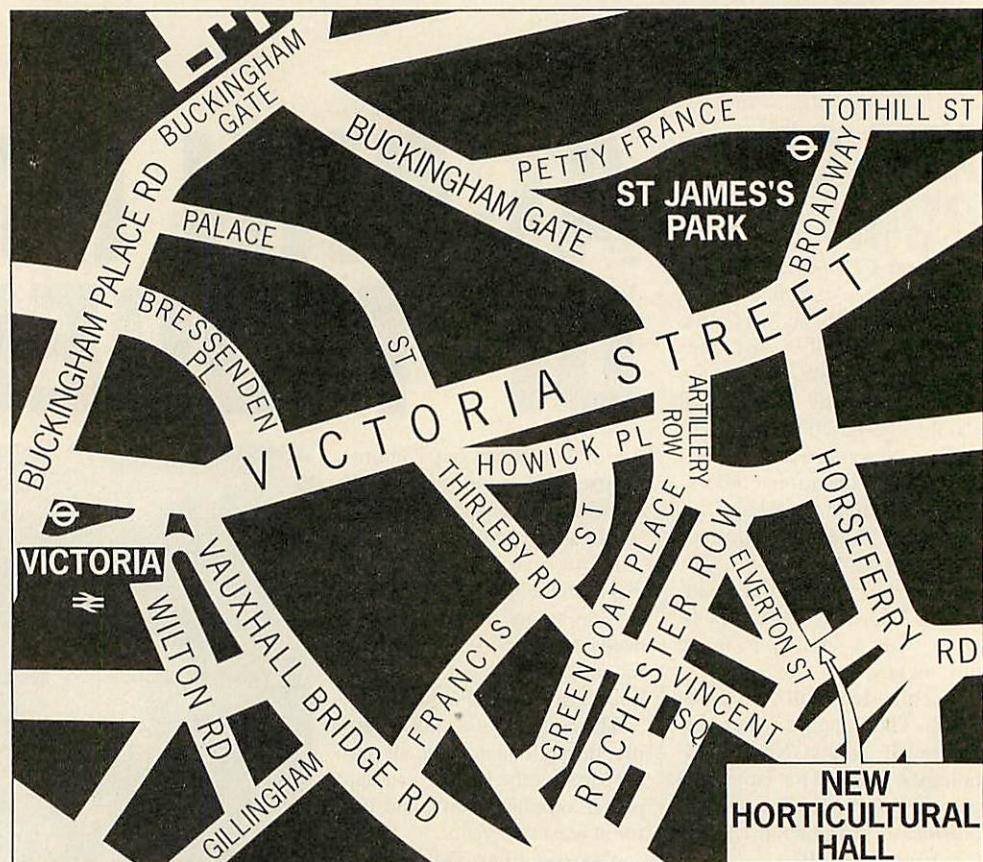
- The National Curriculum in secondary schools
- Inspiration midi sequencer
- Multimedia and CD-Rom in Education

Saturday, September 8

- The View family
- Industrial sponsorship
- Choosing printers and monitors
- DTP on the Arc

Sunday, September 9

- The Inter family
- Networking
- Future trends of Risc
- Introducing the National Curriculum - an update on English requirements in primary schools
- Communications



SHOW UP!

MEET THE BAU TEAM

One of the major benefits of any BBC Acorn User Show is the chance for us to meet the readers. This year's show is no exception, as all the editorial team will be on the BAU stand (nos 56/58) throughout the show.

If it's technical help, or just a query regarding something you've read in the magazine, then pop along and talk to us.

All the staff and regular freelancers will be on hand to offer advice. You will also have the chance to obtain advance copies of the October issue.

Barry Monk, BBC Acorn User's new editor, will also be on hand. He'd like to hear what you think of the magazine.

MORE LAUNCHES

A BAU Show of such magnitude is used by many manufacturers and distributors to show

off their latest wares. Here is a selection of goodies that will appear for the first time.

- Hotlink Presenter from Lindis International features direct data exchange. This allows *Presenter* and *Pipedream 3* to automatically update each other in real-time on screen. Lindis will have Snapshot, its version of the Hawk V9 colour digitiser on show. And it will show what it claims is the only internal SCSI board for the BBC A3000.
- Clares will be launching *Interdictor 2*, which you can see demonstrated on a giant TV screen in the theatre.
- AVP is exhibiting a new series of science lessons that have been developed in association with Somerset LEA.
- Morley will have a new disc drive for the A3000 with a 16-bit interface added to the drive for fast access speeds. 20Mb and 40Mb versions will be on show.
- Computer Concepts will launch *Impression 2* and *Junior DTP* packages.
- Dabhand Computing has a range of calculator and file utilities and a file transfer utility.
- Electro Music Research should draw crowds with Mike Beecher demonstrating his latest version of *Studio 24 Plus*. For use with Studio 24 is a new program called *Dreamwave* - a 32 harmonic wave synth using the Arc sound system.
- Data Design will have *Designer Logic* and *Designer Castles* on show. The former allows you to construct and experiment with logic gates.
- Watford Electronics should have the Ultimatum Podule Racking System for the A3000. It's a plinth unit with four podule slots and can accommodate an optional hard disc interface. Check the WE stand to see if it has an Arm 3 upgrade!

COME TO THE BBC ACORN USER SHOW AND **WIN** £1000 WORTH OF PRIZES

The *BBC Acorn User Show* is the largest and most exciting annual event for all Beeb and Arc users. Our news pages should give you a few good reasons why you should not miss this event – but we can give you another incentive.

In conjunction with Acorn and some of the other leading exhibitors at the show, *BAU* is offering you the chance to win software and peripherals worth over £1000. All you have to do is fill in the coupon below and bring it along to our stand at the show. Your coupon will be entered into our free prize draw – and you stand a chance of winning one of the many prizes on offer.

Prizes from Acorn include copies of:

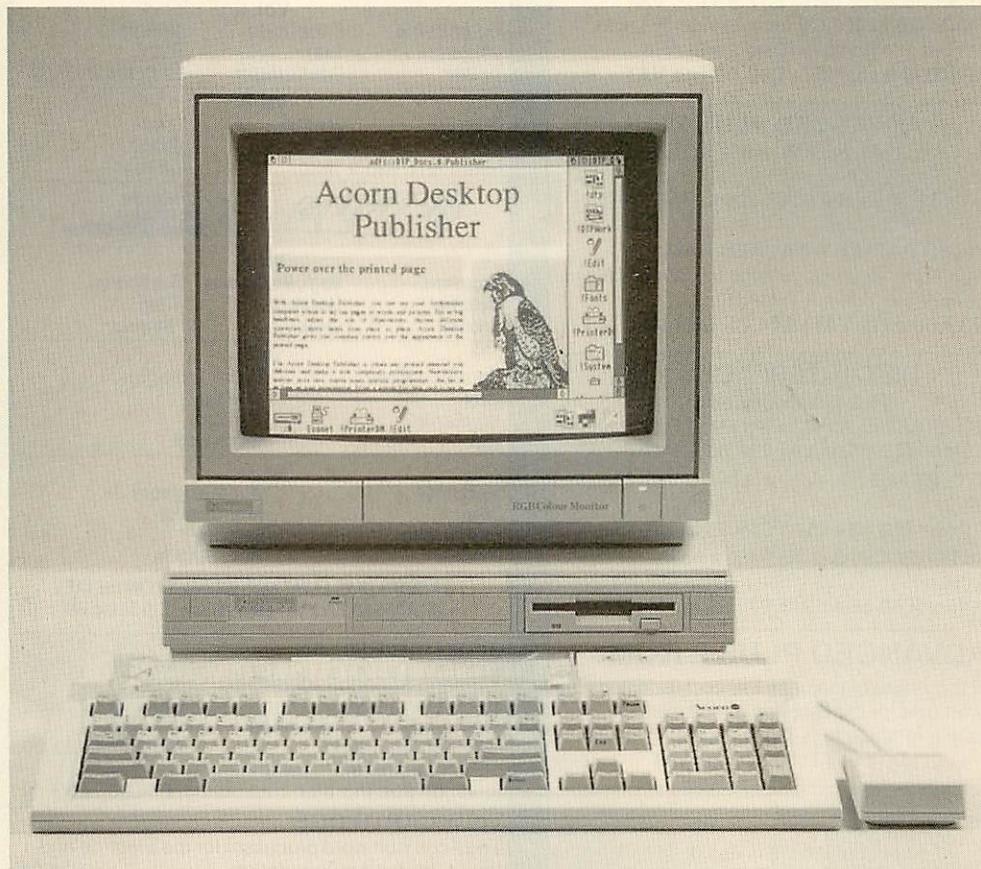
- *Desktop Publisher*
- *First Word Plus*
- *PC emulator*

Other leading exhibitors at the show will also be contributing prizes of other software and useful peripherals for both the Beeb and Arc.

The free prize draw is open for the duration of the show and the winners will be selected and notified as soon as possible after the show ends.

So be sure to bring your coupon along to the show – you could end up being a winner!

Only one coupon per person is permitted. Prizes will be allocated in order of value by the judges. The judges' decision will be final and no correspondence will be entered into. There are no cash alternatives to any of the prizes. The draw closes on September 9 1990.



You could be the lucky winner of Acorn's Desktop Publisher or one of many other prizes

BBC Acorn User Show Free Prize Draw

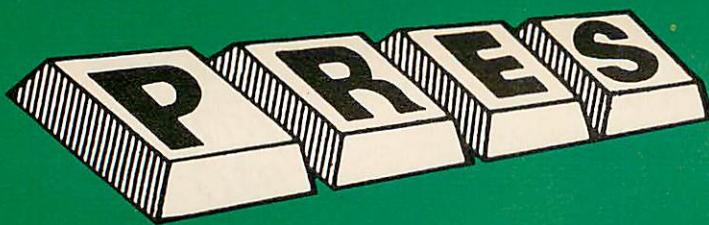
I would like to enter the free prize draw and win one of the super prizes on offer

Name _____

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Please bring this coupon to the *BAU* stand nos 56/58.



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5.25" ADFS (manual avail. sep.) £14.00 ex VAT £16.10 inc VAT 5.25" DFS (2 discs+ ADFS manual) £19.00 ex VAT; £21.85 inc VAT

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"PRES's range of add-ons offers tremendous advantages. The system can grow with your pocket, it offers security and strength but most importantly it offers choice." (AU Feb.90)

The starting point is the monitor plinth, probably (we feel definitely) the best on the market @ only £24.95 (plus VAT), from there... System Housing, Hard Disc Upgrade, Additional 3½" Disc Drive, Additional 5¼" Disc Drive, Podule Case, Dedicated A3000 Disc Buffer, 1770 DFS for BBC Emulator & DFS Filer for Desktop, plus more to come! (the last three products can be added independently of the other items)

Contact your local dealer or call PRES direct on 0276 72046 for advice on upgrading your A3000.
We have built our reputation on honest dealing on quality products with thousands of satisfied customers.

BEEBUG

The Archimedes Specialist

BEEBUG

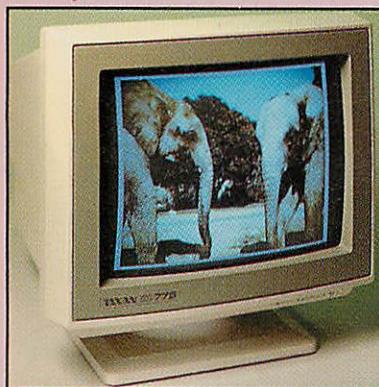
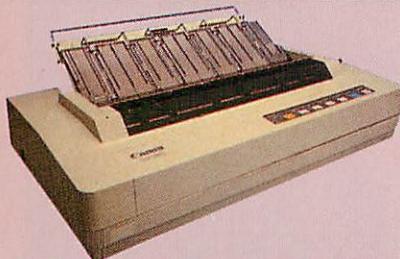
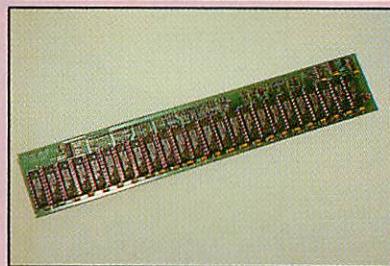
SPECIAL SUMMER PROMOTION

THE A3000 LEARNING CURVE

Acorn's new Learning Curve Package consists of an A3000 computer, First Word Plus V2 (the number one Word Processor package for the Arch), the PC Emulator and Genesis (A graphic based database system with a number of sample files). A parent's guide to the national curriculum and a demonstration video (VHS) is also included.

If you purchase an A3000 or Learning Curve from Beebug, in addition to the backup service for which we are renowned, we will supply free of charge an extra 1Mb RAM board, increasing the computers memory to a powerful 2Mb. For an additional £30 exc. vat we can supply and fit a MIDI/User Port expansion card normally selling for £49. This card allows external equipment to be controlled such as Concept Keyboards.

Learning Curve (no monitor)	699.00 (803.85 inc. vat)
Learning Curve (Acorn Monitor)	899.00 (1033.85 inc. vat)
A3000 (no monitor)	599.00 (688.85 inc. vat)
A3000 (Acorn Colour Monitor)	799.00 (918.85 inc. vat)



THE ARCHIMEDES 400/1 SERIES

For a limited period we are offering a number of unbeatable offers on the 400/1 series computer. It is our company policy only to supply what we believe are the best products available for the price. Our upgrades are equivalent or higher in specification to those supplied by Acorn.

OFFER 1 - £1099.00 (£1263.85 inc. VAT)

An Archimedes 410/1 upgraded with either a high quality 20Mb hard drive or a Star LC-10 Colour printer.

OFFER 2 - £1499.00 (£1723.85 inc. VAT)

An Archimedes 410/1 with a 40Mb fast (28ms) hard drive and either a free Samsung Multi-Sync Colour monitor (RRP £459) or an additional 3Mb of RAM to give the maximum 4Mb of user RAM.

OFFER 3 - £2099 (2413.85 inc. VAT) - A440/1 + £500 of free goods

A genuine Archimedes 440/1 with a 50Mb Hard drive (28ms access time), 4Mb of RAM and a choice of either a Taxan 775+ Multi-Sync Colour monitor or a Canon Bubblejet BJ130e printer offering near laser quality (supplied with a RISCOS printer driver).

Please add £230 (inc. vat) for an Acorn colour monitor or £459.95 for a Taxan 775+ Colour Multi-Sync if required.

Please add £8.00 for postage & packaging per system.
Prices & specification subject to change without notice.

GRANADA HELPS THE R140

Third party computer maintenance company, Granada Microcare, has set up a help desk for Acorn's R140 Unix workstation users.

The help desk allows users to talk through problems with trained staff. The help desk is based at Microcare's technical engineering centre in Bedford and is manned during normal office hours.

Microcare currently uses a mainframe and R140 local area network-based workstation to store information on site.

This is being upgraded with external 330Mb SCSI disc drives that will act as the main storage medium.

For more information contact Microcare on (0234) 226868.



RETAIL MOVE

In an effort to further strengthen its market position, Acorn has created the new post of retail sales manager, which is being filled by Ian Munro.

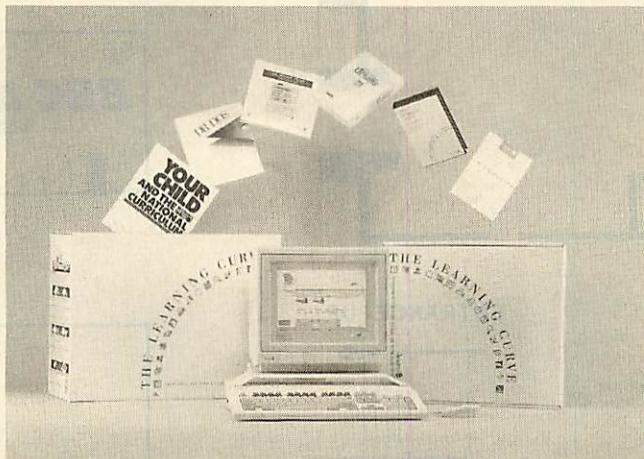
Munro's role will be to maintain and develop Acorn's trade and distribution channels, which currently include Dixons, Alders and John Lewis.

ERRATA

The news story in the August issue regarding Active Book Company carried the wrong telephone number. The correct number is (0223) 355144.

● In the same issue; the news story 'Interactive A3000 Video' referred to a company called AIP. This should have read Allied Interactive.

LEARNING CURVE COMPETITION WINNER



We are proud to announce a winner to the Learning Curve competition which was set in the June issue.

The competition attracted over 1000 entries, all eager to win the prize, valued at £1000.

After rifling through the accumulated mountain, the editor eventually surfaced with details of the winner.

Our congratulations go to Adrienne Knight of the Old Kent Road, London.

Adrienne is now the proud owner of the Learning Curve package which consists of a 1Mb BBC A3000 and Acorn colour monitor.

Also included in the prize is £200 worth of software, including *Genesis*, *First Word Plus*, *PC Emulator*, a video and instruction manuals.

When informed of her good fortune, Adrienne said, 'I'm delighted, I was considering buy-

ing a wordprocessing system, but I won't need to bother now I've won.'

In order to win, Adrienne had to match the names of seven famous fictional characters with the schools they attended.

The correct answers are:

- Tom Brown, Rugby
- Pug, Bash Street
- Tucker Jenkins, Grange Hill
- Billy Bunter, Greyfriars
- Jennings, Linbury Court School
- Nicholas Nickelby, Dotheboys Hall
- Molesworth, St Custards

The two red herrings were Mill Hill and Little Oaks. The former was the ex-editor's school, and the latter, well from little oaks....

● The winner of the readers' survey competition will be announced in the October issue of *BBC Acorn User*.

NEW VDU RULES

The European Community has adopted rules concerning the use of visual display units at work. These include rights to periodic breaks and regular eye tests.

The EC action comes in the form of a directive, which requires each member government to adopt legislation by

1992. Even though Britain abstained from the unanimous decision to adopt the rules, they will apply, in part, after 1992.

The rules also call for glare-free and swivelling screens, adequate spacing between characters and lines and adjustable seats with a footrest if requested.

NEWS IN BRIEF

● Circle Software has released three new *Premier* application packages, and restructured its pricing.

Premier now costs £119.25. The three applications are an improved wordprocessor, database and a letter filing system. Applications cost £28.75.

Earlier versions of *Premier* can be upgraded to V3.1 at no cost.

Circle Software can be contacted on (0793) 770021.

● *FontFX*, the Risc OS utility from Data Store that creates Draw files using outline font definitions, has been upgraded.

Version 4.00 can handle larger numbers of fonts, a shadow direction facility and a built-in preview window.

FontFX costs £9.95 plus 50p p&p. Upgrades are free by sending the original disc back with a 20p stamp.

Data Store can be contacted on 081-460 8991.

● Database Software is currently developing Fun School 3.

Age groups for Fun School 3 have been structured to fit in with the National Curriculum. Versions will be available for the BBC micro and Archimedes.

Database Software is on (0625) 859333.

DIARY DATES

7-9 September. *BBC Acorn User* show, Westminster Exhibition Centre, London. Contact: Safesell on (0737) 814084.

25-28 September. Business Computing 90, Earls Court, London. Business and trade exhibition only.

Contact: Montbuild on 071-486 1951.

6-9 December. *Computer Shopper* 1990 show, Wembley Conference Centre, London.

Contact: Cape Cowley Associates on 061-480 9811.

BBC ACORN

USER

*SHOW
'90*

BBC ACORN

USER

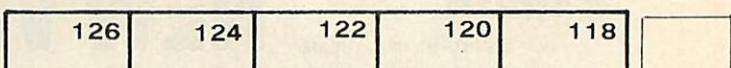
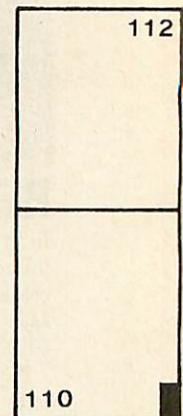
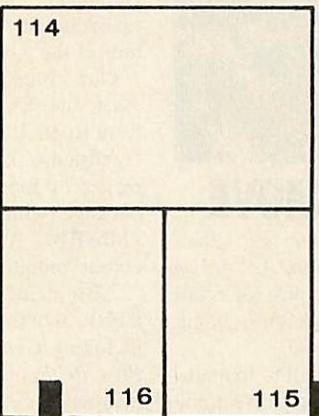
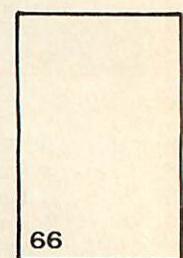
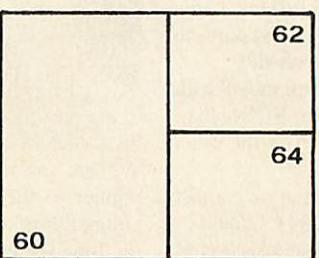
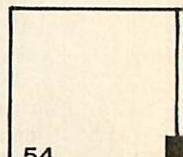
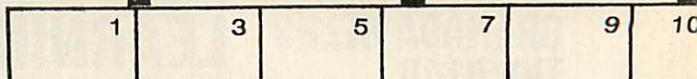
*SHOW
'90*

ACORN
COMPUTERS

ENTRANCE UP

UP TO STAGE

ENTRANCE UP

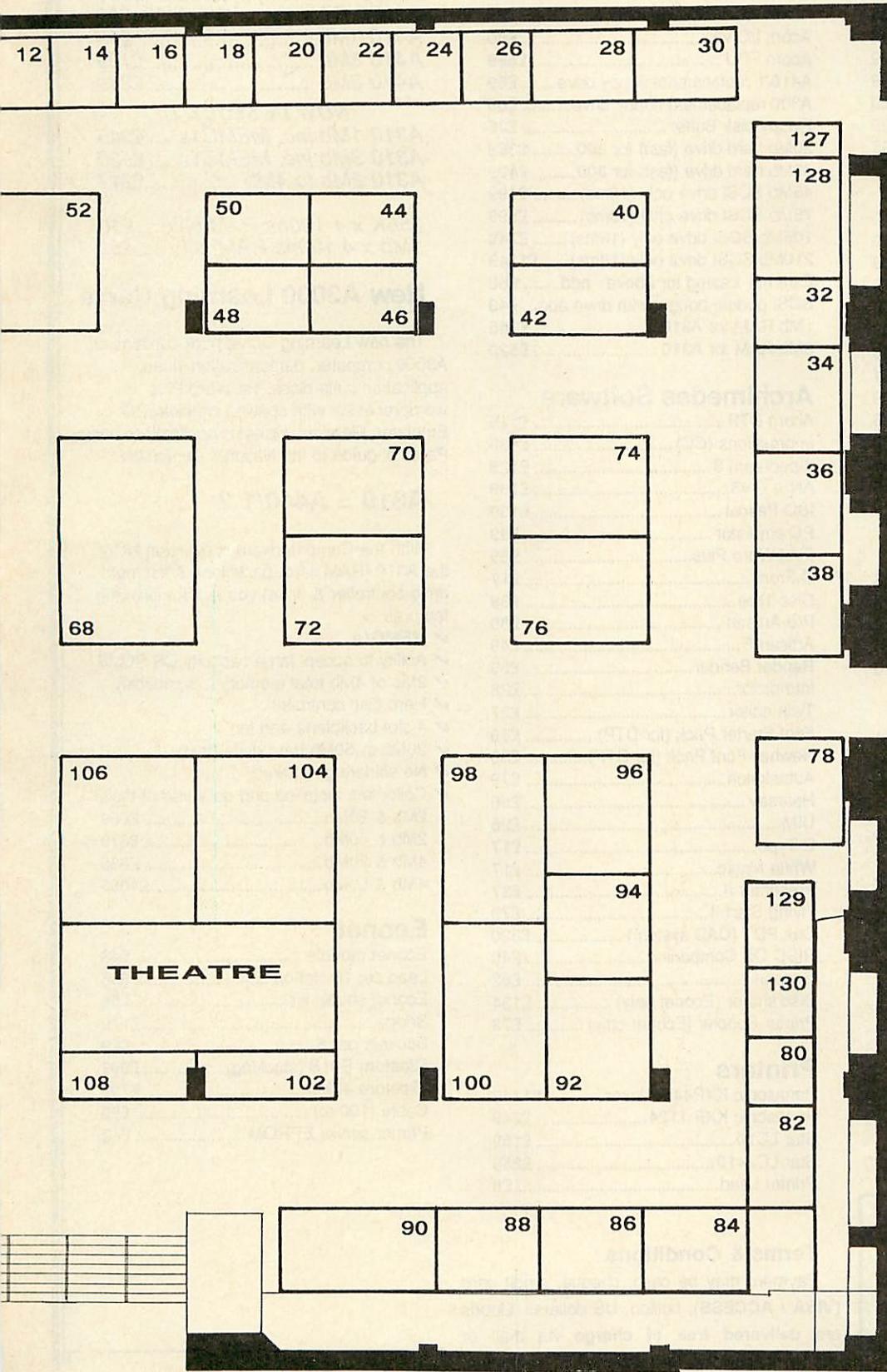


WESTMINSTER

(NEW HORN)

BBC ACORN
USER
SHOW
'90

EXHIBITOR LIST



EXHIBITION CENTRE
AGRICULTURAL HALL)

Dias. Acorn Computers Ltd 1. HSV Computer Services Ltd 3. Schools Project 5. Logic Sales Ltd 7. Gaynor Hi-Tech Ltd 9. Spacetech 10. Care & Morley Electronics 12. LCL Educational Software 14 & 16. Videk Ltd 18. CDS Software 20. HS Software 22. MJD Software 24. Micro Studio Ltd 26. Cue Video 28. Schools Project 30. Rickitt Educational Media 32. Cambridge International Software 34. AVP 38. CJE Micros 44. Paratex 46 & 48. Calderglen Computers Ltd 50. Weserve 52. QD Enterprises Ltd 56 & 58. BBC ACORN USER 60. Minerva Systems 62. Circle Software 64. A & B Computing Magazine 66. Lindis International & Wild Vision 68. Watford Electronics 70. Software Solutions & Ace Computing 72. Fourth Dimension 74 & 76. Beebug Ltd 78. Electromusic Research 80. Electronic Font Foundry 82. Arxe Systems Ltd 84. User Club Corner 90. Orion Computer Services 96. Pineapple Software 98. Data Design 102. NADI Systems 104. Irlam Instruments Ltd 106. Clares Micro Supplies 110. Dabhand Computing 112. Pres 114. Computer Concepts 115. Capricorn Consulting 116. Colton Software 118. 4Mation Educational Resources 124. Ian Copestake Software 126. Norwich Computer Services 127. Mewsoft 128. Nasa Promotions 129. Topologika 130. Corplan Computer Services 131. Theatre

Computerware

■ Phone for special prices
on complete systems!

Archimedes 410

Archimedes 410/1	£1099
1Mb RAM for 410	£69
3Mb RAM for 410	£199
20Mb hard drive (fast)	£199
40Mb hard drive (fast)	£349
50Mb hard drive (fast)	£479
SCSI card (Acorn)	£269
SCSI card (CW)	£169
Floating point unit	£529
Midi card	£65
Metalwork + cables for drive (DIY)	£21

Archimedes 3000

Archimedes 3000 base unit	£599
A3000 'The Learning Curve'	£699
A3000 + colour + plinth	£779
1Mb RAM expansion	£96
3Mb RAM expansion	£369
20Mb hard disk (CW)	£399
Plinth (PRES)	£24
Serial upgrade	£19
User & Midi podule	£46
Floppy disk buffer	£26
Internal SCSI card	£169
external SCSI podule	£169
TV Modulator (OUT OF STOCK)	£26

Extras

Mouse mat	£5
Keyboard cable extender	£6
Printer lead	£8
Floppy discs (10boxed, TDK)	£14
Special leads (made to order)	£10

Monitors

Acorn Colour	£199
Eizo 9060-SZ multiscan	£465

Books (no VAT)

Acorn PRM	£79
C: A Dabhand Guide	£14
BASIC V: A Dabhand Guide	£9
Archimedes Assembly Language	£14
Archimedes Operating system	£14
BBC Basic Guide (Acorn)	£19
A3000 Technical Manual	£29
Econet Advanced User Guide	£5
Econet level 3 manager's Guide	£5
Archimedes First Steps	£9

Upgrades

Aleph One ARM3 30MHz	£579
MEMC1a	£45
Atomwide APEC	£33
Atomwide VIDC enhancer	£26
Acorn I/O v2	£80
Acorn FPU	£529
A410/1 replacement floppy drive	£69
A300 replacement floppy drive	£69
Floppy disk Buffer	£26
20Mb hard drive (fast) for 300	£369
40Mb hard drive (fast) for 300	£499
45Mb SCSI drive only (18ms)	£499
75Mb SCSI drive only (18ms)	£599
105Mb SCSI drive only (18ms)	£749
210Mb SCSI drive only (18ms)	£1149
External casing for above add	£60
SCSI podule bought with drive add	£49
1Mb RAM for A310	£345
3Mb RAM for A310	£520

Archimedes Software

Acorn DTP	£119
Impressions (CC)	£139
Pipedream 3	£129
ANSI C v3	£139
ISO Pascal	£139
PC emulator	£99
First Word Plus	£69
C-Front	£17
Disc-Tree	£39
Pro-Artisan	£89
Artisan 2	£49
Render Bender	£59
Interdictor	£28
Twin editor	£27
Fent Starter Pack (for DTP)	£39
Newhall Font Pack (for DTP)	£39
Autosketch	£79
Hearsay	£56
UIM	£26
E-Type	£17
White Magic	£17
Presenter II	£37
Flying Start II	£79
Oak PDT (CAD system)	£320
RISC OS Companion	£49
Genesis	£82
Disc sharer (Econet only)	£134
Printer Spooler (Econet only)	£79

Printers

Panasonic KXP4450i laser	£1345
Panasonic KXP 1124	£249
Star LC10	£159
Star LC2410	£259
Printer Lead	£8

RAM Specials

A305 0.5Mb	£34
A3000 1Mb	£96
A3000 3Mb	£369
A3000 RAM board OK RAM	£39
A410 1Mb	£69
A410 3Mb	£199
A440 8Mb	£849

NOW IN STOCK !!

A310 1Mb inc. MEMC1a	£345
A310 3Mb inc. MEMC1a	£520
A310 2Mb to 4Mb	£217

256K x 4 100ns RAM chip

1Mb x 4 100ns RAM chip

New A3000 Learning Curve

The new Learning Curve pack contains an A3000 computer, demonstration video, application suite discs, 1st Word Plus wordprocessor with spelling checker, PC Emulator, Genesis, Genesis applications and a Parents' guide to the National Curriculum

A310 = A440/1 ?

With the Computerware conversion kit for the A310 (RAM card, backplane & fan, hard drive controller & drive) you get the following features ->

- ✓ MEMC1a
- ✓ Ability to accept large capacity OS ROMS
- ✓ 2Mb or 4Mb total memory (upgradable)
- ✓ Hard disc controller
- ✓ 4 slot backplane and fan
- ✓ 20Mb or 50Mb hard drive (fast)
- ✓ No soldering required
- ✓ Collected, installed and delivered (3 days)
- 2Mb & 20Mb
- 2Mb & 50Mb
- 4Mb & 20Mb
- 4Mb & 50Mb

Econet

Econet module	£49
Lead set 10 station	£35
Econet starter kit	£86
Bridge	£179
Sockets per 5	£29
Filestore E01S (stacking)	£999
Filestore 40Mb	£799
Cable (100 m)	£99
Printer server EPROM	£42

Computerware Research Ltd.

9-11 Livestock Market

Hall Road

Norwich

Norfolk

NR4 6DW

0603-507799

fax: 0603-507789

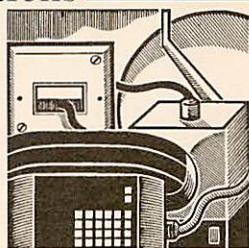
Terms & Conditions

Payment may be cash, cheque, credit card (VISA / ACCESS), bullion, US dollars. Goods are delivered free of charge via mail or courier depending on size. UK customers please add 15% VAT. Export no VAT, carriage at cost. Personal callers welcome.

Specifications / price subject to change without prior notice. Goods available subject to stock levels.

Please note:

Prices exclude VAT @15%
Delivery in the UK free.



ARMCHAIR SHOPPING

Anyone remember Chris Curry, one of the co-founders of Acorn (along with Hermann Hauser)? Chris has not been idle since parting company with Acorn some time ago.

Indeed, if all goes well his online shopping service, Keyline Shopping, will be launched next year. Online shopping is not new – some have tried it in the past and failed. According to industry pundits, however, this will not happen with Keyline.

The idea behind the scheme is to let consumers enter their shopping lists on a terminal, pay for the goods using a smart card, and have them delivered to their home. Prior to launching the service, companies including Freemans, Kays, Littlewoods, Gateway Foodmarkets, WH Smith, Nat West and others have signed up for the service.

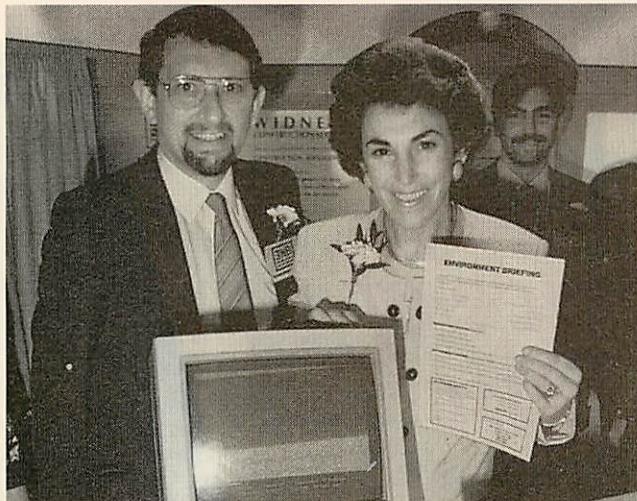
Customers pay a £50 sign-up fee for using the service, and the terminal is thrown in 'free'. After that, the only costs involved in the service are the price of the phone call to the Keyline computer. I don't know if Keyline will allow anyone access to the service with the customer's own terminal equipment, but I would expect so.

BIG BLUE

The UK domestic datacomms scene is about to receive a much needed boost from IBM.

Big Blue has released a range of entry-level 286-based PCs called the PS/1 series. Low in cost, they have high specifications and are bundled with lots of software. They're also equipped with a modem and viewdata-compatible software as standard, together with a special registration to Prodigy, a US viewdata service.

When the PS/1 family is launched in the UK, IBM will no doubt wish to offer UK punters a similar deal. My guess is that the company will organise a special registration offer with



Telecom Gold users now have access to an environmental newsletter called Environment Briefing. Aimed at commerce and industry, it offers news on publications, and allows readers to build up their own reports. Question, why is Edwina Curry at the launch of the service, and is that a flash reflection on the screen, or a graphic of an egg? I think we should be told!

Prestel, the UK's national viewdata service.

What has this got to do with us Acorn owners, I hear you cry? Not much directly, but, in the long term, rather a lot. You see, IBM is pushing the PS/1 series in a big way, and expects to sell in the hundreds of thousands within a year or so.

The more the better I say, as there will be more people using modems and associated online services, and that has got to be good news for all online computer users.

GATEWAY NEWS

Regular readers will remember me wittering on about a gateway from Prestel to Telecom Gold. Micronet subscribers have had such a facility for some time, called Interlink.

The news is that the gateway (which can be accessed by all Prestel subscribers) now offers a scrolling terminal facility. In other words, you can use the gateway with conventional scrolling terminal software.

This development has been on the cards for some time now,

and it means that Telecom Gold can be accessed on a local call basis by 90 percent of the population – providing they subscribe to Prestel.

To use the scrolling gateway you'll need to use viewdata software that can be switched to terminal mode. Most Beeb and Arc packages allow you to do this. The benefits of using 80-column terminal access for Gold are numerous, as the service was designed for it in the first place.

In use, the 80-column gateway does have a couple of quirks. First, for some strange reason it locks up now and then, especially with an incoming stream of text.

The way to get around this is to press RETURN. It 'wakes up' the host, but also introduces a carriage-return into the text, which is no fun.

As far as file transfer is concerned, forget it. File transfer is useless over a seven-bit link (as Prestel is), and I haven't tried Kermit to see if that works yet. If anyone has, please let me know.

David Janda

NEWS IN BRIEF

● Arc users take note – a new BB dedicated to Archimedes users has opened for business. Called Arcade, it can be contacted on 081-654 2212 at a variety of speeds up to v.22bis.

The system uses Hugo Fiennes' ARChbs software on a 410/1 which has been expanded to 4Mb. There are three lines connected to the system which uses WS3000 modems. Other features include 23 conference areas and 18 file areas with around 24Mb of files to download.

● A letter from a reader in Holland informs me of a useful item of PD software for the Arc. Rob Schrauwen has written an item of code called DosFS. It's a filing system that reads and writes to and from Dos/Arc discs. Rob has entered his program into the public domain, and apparently it's doing the rounds of various BBs in the country. So, why pay for such a handy item when you can download it absolutely free!

● Another reader has written in to promote Resolve Communications BB, which is on (0582) 832653.

Duncan Webster sings the praise of said BB, and I'm sure the fact that he has an area on the board dedicated to his programs has nothing to do with it! According to Duncan the board 'is well presented and what stands out is the dedication of the sysop (John Carpenter).'

I would like to give you my own report on the board, but it's been engaged whenever I've called! However, if anyone else wishes to promote a BB they like, please write in and do so.

If you have any comms news please send it to David Janda at BBC Acorn User, or contact him on Telecom Gold 81:RED001 or via Prestel 919992492.

for the A3000 & Archimedes

ovation

Professional Desktop Publisher

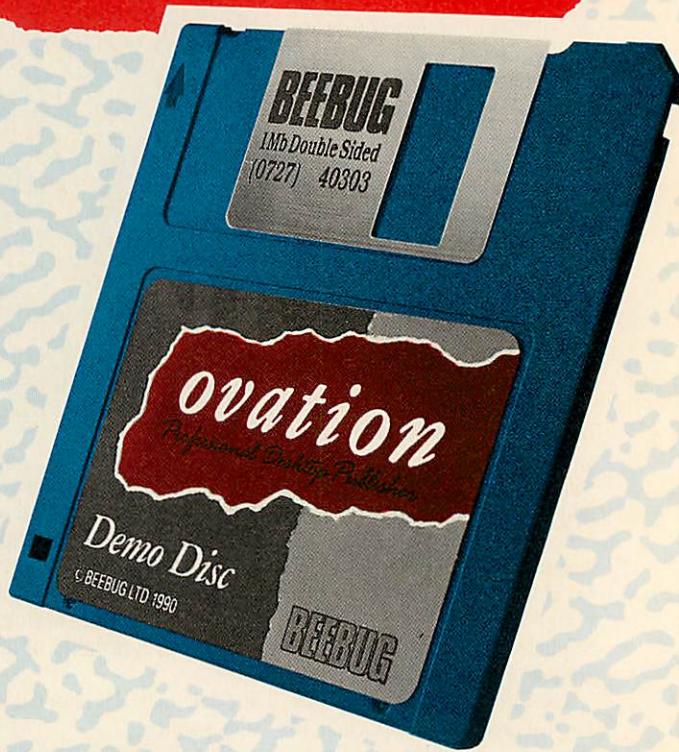
Try it Yourself for the Price of a Blank Disc

This highly professional DTP and Wordprocessing system for the Archimedes & A3000 is now available. Ovation is without doubt the most sophisticated and exciting piece of software yet released by Beebug and we are confident that you will be addicted as soon as you try it.

Its ease of use, instinctive feel and full feature list make it excellent value at only £113.85 (inc. VAT). If you are considering purchasing a Wordprocessor or DTP package, or you are unhappy with your current set-up, we recommend that you seriously consider Ovation.

But don't just take our word for it!

We are so confident that you will be impressed with Ovation that we have produced a demonstration version to enable you to evaluate it for yourself. It has most of the features of the full version allowing you to really get a feel of how easy Ovation is to use. It is even supplied with a mini manual to get you started. However, you will not be able to save your files to disc and all print-outs are marked "Demonstration."



The cost of this demonstration version is just £5.00 inclusive of postage. And if you then decide to buy Ovation, we will refund the £5.00, and you can still keep the disc.

Order Form

Please send me 1 Ovation demo disc at £5.00 inclusive of VAT and postage. Stock Code: 0114

Please debit my Access/Visa/Connect Account no.

Name: _____

Address: _____

Expiry date ____/____

I enclose a cheque for £5.00

(Please delete as appropriate)

Signature: _____

Postcode: _____ A9

Send to: BEEBUG, Ovation Demo Disc, 117 Hatfield Road, St. Telephone: 0727 40303 Fax: 0727 60263



NEWS IN BRIEF

● Watt's this? It's *A Town Like Wattville*, a package which simulates electricity usage in a modern city.

It has been produced by Understanding Electricity, the educational arm of the electricity industry and is aimed at GCSE and A-level students across a variety of areas of the curriculum, including maths, science and home economics.

Among other activities, the software allows you to design a town customer by customer; supply all users with electrical power; analyse consumption patterns; and decide on charges.

A Town Like Wattville is available at £12 for both the Arc and the BBC/Master range. Understanding Electricity is at 30 Millbank, London SW1P 4RD.

● A series of booklets has been developed by South Glamorgan's Advisory Centre for Computers in Education to support teachers grappling with the National Curriculum.

They aim to help schools plan the use of IT in the curriculum by providing practical examples, avoiding jargon and technicalities. They cost £12.50 or £25 outside Wales, from the ACCE, Cefn Road, Cardiff CF4 3HS.

● Is absenteeism rising at your school? Which pupils were away last week? Who is late most often? Are these questions you want answered? If they are, Chalk Soft has a program for you.

Mark Master is a system for recording and monitoring pupil data, especially related to attendance. It uses the noughts and crosses on registers as its raw material and reveals the information hidden behind them.

The A3000 version costs £69, for the Beeb/Master it's £59. Chalk Soft can be contacted at PO Box 49, Spalding, Lincolnshire PE11 1NZ.

MAKING AN EXHIBITION



Designed to assist with science teaching at all levels, Balance Monitor runs on a Beeb and can be used in conjunction with any GEC Avery balance which has a parallel output. It will automatically monitor and collate weight readings, carry out statistical analyses and display results as graphs. GEC Avery's is at Smethwick, Warley, West Midlands B66 2LP.

The exhibition and conference season is upon us again so here's two for your diary.

The third *Micros for Special Needs* exhibition is run by Northwest Semerc at the Queen Elizabeth Hall, Oldham. It lasts from Tues, Oct 9 to Thurs, Oct 11 and will be opened by Malcolm Thornton MP, chair of the Parliamentary Select Committee on Education.

The exhibition will feature children with special needs from 11 LEAs in England and Wales demonstrating how they use computers; relevant national and regional bodies; and 50 companies selected by Northwest Semerc for the contribution their products are making to the field of special needs.

Even non-SEN specialists may find *Micros for Special Needs* interesting and informative. For further details contact Northwest Semerc, Fitton Hill CDC, Rosary Road, Oldham OL8 2QE.

The Resource conference and exhibition is really the northern equivalent of BETT. This year's accompanying conference is entitled *IT Across the National Curriculum - A Celebration*.

It will tackle issues high-

lighted by the implementation of the National Curriculum and the use of IT within it.

Seminars are being held on various areas including English, modern languages, humanities, technology, science, maths, music and art, plus special needs and cross-curricular issues.

Speakers will include Dave Beaumont of South Thames College on Logo beyond maths; HMI Bob Dyke on IT and SEN; Derek Allen on managing the curriculum with CASS; and NCET's Andrea Tapsfield on IT and geography.

The emphasis is on classroom experience and the supporting exhibition will be extensive.

The Resource conference takes place on November 15 at Doncaster Race Course. The delegate's fee is £12. Details are available from Trevor Millim at Resource, Exeter Road, Doncaster DN2 4PY.

HOME AND AWAY

Acorn has announced the nationwide extension of its Home and School initiative.

Headteachers in every school in the country have been sent details of the scheme and an invitation to participate.

The Home and School initiative was launched in March with the release of the Learning Curve package. It originally operated in just five LEAs.

The idea is that Acorn dealers work with schools to help parents understand the growing importance of new technology to their children's education.

Obviously the hope is that having seen how important a computer is to their child's education, parents will snap up Learning Curve bundles.

In three months, 12 specially recruited dealers have organised events at over 100 schools.

Avril Ross of MAV Ltd, a participating dealer in Berkshire, says, 'The response to the events has been extremely encouraging. Parents are keen to be involved.'

'The schools have also given their full support, inviting teachers from surrounding schools and often promoting the events in the local press.'

UNIVERSAL MUSIC

The long-awaited Music 5000 Synthesiser Universal from Hybrid is now available.

A low-cost add-on, the Universal, replaces your machine's usual 'beep' with its own digitally-synthesised instruments. Sixteen sounds are on offer and up to four may be mixed together and played at once.

What's more, the Universal software is preset for 50 of the most common educational music programs and includes print options. The synthesiser works through the computer's own speaker or through any existing amplifier or music centre.

It is intended for primary classrooms but will find applications in special needs and at secondary level - in fact, wherever music is made in schools.

The Music 5000 Synthesiser Universal costs £99. Music 5000 owners only need the software for £29. (More details on the Music column on page 23.)

Lisa Hughes

DO YOU FIND NETWORKING YOUR ARCHIMEDES A SLOW, PAINFUL STRUGGLE?



SJ Research provides you with a solution to the strain of working with your network—NEXUS, a high speed, shared hard disc for the Archimedes.

NEXUS will introduce you to a new approach in data storage, providing high speed access to centrally stored programs, leaving the floppy disc and the network free for storing user data.

NEXUS is easy to manage, with just one hard disc shared between up to eight Archimedes. It also solves the security problem: the turn of a key protects the disc from interference.

NEXUS is the perfect system for the classroom, where it is quick and simple to set up and can be adapted to any teacher's individual needs. It gives you the time to do what you do best, teach, instead of having to struggle with your computer system.

So, when it comes to making the most of Archimedes, NEXUS is certainly top of the class.



GIVING YOU THE TIME TO TEACH

NEXUS

FOR FURTHER INFORMATION, PLEASE CONTACT — SJ RESEARCH LIMITED, INTERCELL,
1 COLDHAMS LANE, CAMBRIDGE CB1 3EP. TELEPHONE: 0223 461406 FAX: 0223 461133



WHAT? NO SOFTWARE?

The world's fastest micro may be an Einstein at maths and a Rembrandt with graphics but it's still a coda short of a full sonata when it comes to music.

Joseph Rose of Cardiff writes to say that he is very happy with his *Studio 24 Plus v.2* but laments the lack of voice editing software. Come to that, there are no librarians, composition programs or MIDI drum pattern editors and, in case it had escaped anyone's notice, there is still only one Arc sequencer – from the ubiquitous EMR. Even if *Inspiration* arrives, its proposed £459 price-tag puts it out of the reach of many users.

The Archimedes is no longer a budding babe in Acorn's arms – it has been on the market for over three years (doesn't time fly?) in which time Acorn has assiduously touted its worth as a music computer. In far less than three years the Atari ST rose to prominence as the dominant music computer. The Archimedes is potentially a far superior machine so what's going wrong? Where is all the music software?

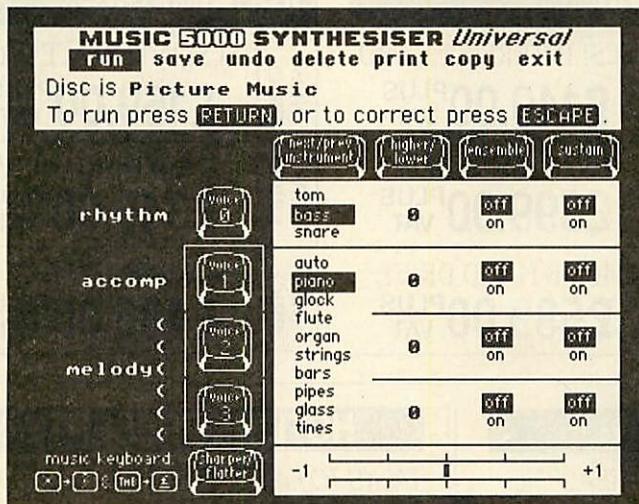
That's easy to answer – no one (with the exception of EMR) is writing any! But why? Part of the problem is the chicken and egg situation. The ST market is still the largest for the would-be music software developer. However, Acorn is one of the few companies to have achieved a degree of brand loyalty and the number of Archimedes increases daily.

I know, too, that Acorn has always been extremely supportive of anyone wishing to write music software.

Is the Arc destined to become the musical outcast of the computer fraternity? Your thoughts and comments are welcome – particularly from music software writers!

MUSIC SYNTHESISER

Hybrid Technology's Music 5000 Synthesiser Universal,



Hybrid's Universal music system – a Master piece

which was announced in this column several months ago, has now been officially released. (See a full review of this software in next month's issue)

It runs on a BBC Master and the full package consists of Music 5000 plus software which loads into sideways Ram. The software is available separately for existing Hybrid Music System owners.

The program intercepts calls to the sound chip and channels them to the Music 5000. It works with all well-written BBC music programs and is transparent to the user.

The difference it makes to the programs is amazing – it gives many a new lease of life and will be a boon in education. A start-up sequence recognises the music program being run and selects a suitable set of sounds.

It even has an entry for my book, *Making Music on the BBC Computer*. The sounds can be changed within the program even as the music is playing.

The *Spellmaster* Rom can cause the system to crash (it has been known to have a detrimental effect on other programs, too) so if your Universal ducks out, check your Roms.

More information from Hybrid Technology Ltd, 273 The

Science Park, Cambridge, CB4 4WE. Tel: (0223) 420360.

EASY MENUS

This month's yellow pages contains an auto menu selection program which will be particularly useful for the disabled, although it also offers an alternative method of song selection for all Hybrid System users.

Enter the program and save it as 'jukebox'. The RUN word should contain a list of the songs on disc from which you want the user to choose. When you run the program, the cursor will automatically move down and then up the menu. To make a selection, press the SHIFT key or the fire button on a joystick.

The program will work with any Ample Menu program. Programmers can develop the joystick code to produce joystick-driven Ample programs.

EXTRA AMPLE ALBUM

The latest Ample album release from Hybrid Technology is another by budding young composer Michael Harbour. It's called *Windy Island* and shows the further development of Michael's musical style.

The album costs £4.95 from Hybrid Technology.

Ian Waugh

NEWS IN BRIEF

● Do you own an Arc running EMR's *Studio 24*? Would you like some ready-to-go arrangements to play through your system? Then check out a range of 'songs on disc' from Hands On Music Software. The discs contain arrangements in MIDI format that load into EMR's *Studio 24*. They are optimised for Roland's MT-32 expander but work with any other synthesiser.

Titles include a range of Chart Hits with five songs per disc for £19.95 plus Big Band and Classical discs. Hands On Music Software is at 14 Lodge Road, Bedhampton, Havant, Hants, PO9 3LL. Tel: (0705) 452628.

● Recording Access for Music Production for the disabled (RAMP) is a charity whose aim is to bring music within reach of the disabled, mainly through computers.

Help is needed, both financially and with equipment and transport. If you think you can help, contact Roy Cramer, Paul Monaghan or Howard Davies at RAMP, 14 Challis Road, Brentford, Middlesex, TW8 9PR. Tel: 081-568 5266.

● A branch of the US-based IMA (International MIDI Association) has been set up in the UK. The IMA acts as a co-ordinating body for the development of the MIDI spec and provides a help-line service. The UK MIDI Association (UKMA) will have three levels of membership – individual (£34.50), Group (£69) and manufacturers (£138). For details contact Vic Lennard at UKMA, 26 Brunswick Park Gardens, New Southgate, London, N11 1EJ. Tel: 081-368 3667.

If you have any music news, tips or topics you'd like to see covered in this column write to Ian Waugh at BBC Acorn User, 20-26 Brunswick Place, London, N1 6DJ.

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More technology for less money

HARD DRIVE - IMPROVED PERFORMANCE AND PRICE REDUCTIONS

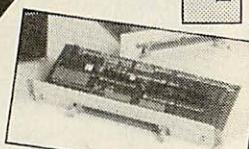
SCSI
NEWS

A3000

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ARE AVAILABLE

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COLOUR IMAGES "GRABBED" IN REALTIME
Snapshot allows the Archimedes user to digitise
pictures in colour and realtime, using standard
Video equipment.



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Snapshot is a full 12 bit digitiser with an
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Colour Converter still
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Contact your local dealer
for further details about all
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In case of difficulty ring (098 685) 477

HOTLINK PRESENTER

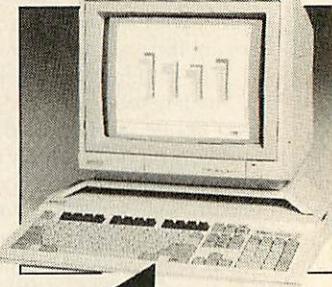
TALKS TO PIPEDREAM 3

For the first time, two Acorn applications can
communicate with each other in real-time in
the RISC OS environment.

HotLink Presenter includes all the features
of Presenter II (the professional graphics
programme which enables you to present your
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HOTLINK PRESENTER
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Use your Archimedes or A3000 for that important
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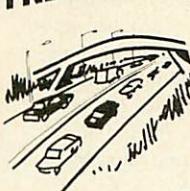
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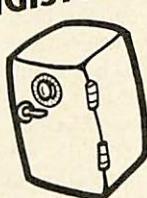
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Designed to complement Acorn hard disc, providing fast, reliable storage of data for security and system flexibility. For use with BBC and Archimedes computers. Saves at a rate of up to 5.2 Mb per minute on standard 1/4" tape cartridges. £1249.00 + vat application kits £50.00 + vat

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A3000 Computer (base unit)	£559.00
A3000 & Learning Curve Pack	£659.00
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Acorn Monitor (only with Acorn System)	£189.00
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Panasonic KXP 1124	£255.00
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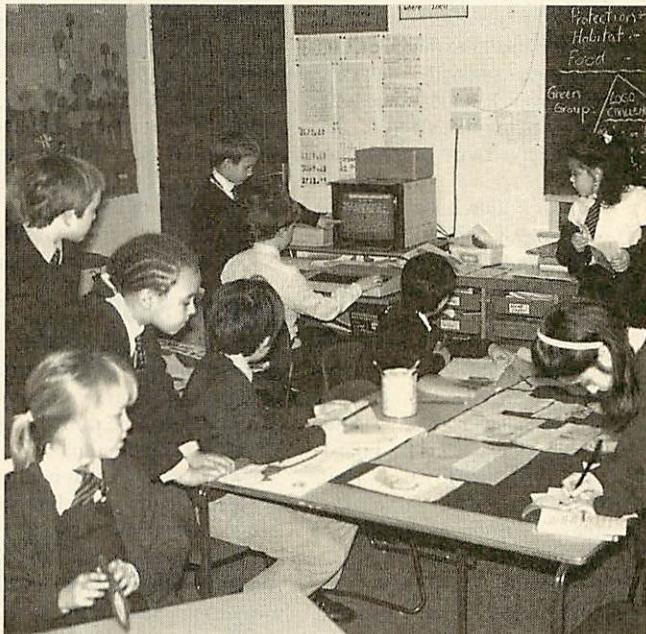
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BACK TO SCHOOL



It's class wars again, with the kids getting back to school and parents getting used to a relatively quiet and peaceful life once again.

But how can parents become more involved in their children's education?

We offer some useful advice and examine further the needs of special education, and look at how computers can help in religious teaching. Software for maths is also summed up.

There's more in our image processing series and another foray into the depths of ARM2 programming.

Plus, we design some posters with the program of the same name from 4Mation, and if

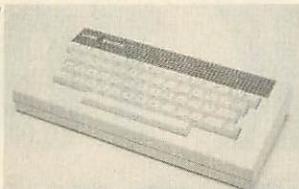
you're interested in printing in technicolour, six low-cost dot matrix printers get the full BAU test treatment.

Of course, if you prefer to scan your images, then our conclusions about the latest in colour scanners should interest you.

October's issue has all this and more. Because as well as the usual mix of reviews, games, hints, tips and news, there is an added bonus.

The 24-page Business supplement will have every potential tycoon fighting at the newsstands. Full of invaluable advice on how to put your Arc to the best use at the office, the BBC Acorn User supplement is definitely not to be missed.

**ORDER YOUR COPY NOW –
IN THE SHOPS SEPTEMBER 13TH**



Electron: it costs to enhance

LAST WORD

I agree with the sentiments expressed in Peter Honcap's letter in the July issue of *BBC Acorn User* that the Electron is an excellent machine that provides everything users will ever need.

However, I cannot agree with his suggestion that Archimedes owners have more money than sense.

As an enthusiastic Electron programmer, and occasional contributor to Hints and Tips, I think I have got a great deal out of the computer.

However, when I work out how much money I have spent on the Electron, by adding a Plus 1, cassette player, shadow Ram, turbo, sideways Rom board, sideways Rams, *View*, *Viewsheet* and connecting cables, all of which seemed essential to realise the machine's full capability, then I realise that my new A3000 represents good value for money six years on.

Computer users want colours, high-resolution graphics, speed of processing and impressive sound. The Archimedes has these in abundance and I, for one, am a convert.

Andrew Pillidge
Woking

SORRY...

Further to the Questions and Answers article in the July 1990 edition of *BBC Acorn User*, a misleading summary of our *DataVision* product was presented. First a price of £199 was quoted, whereas the price of the package is in fact £99. We feel this gives high performance at an affordable price.

Secondly, the article implied that the package is not available as yet. In fact it has been available as of February 1990 from Silicon Vision and all major Acorn dealers.

Finally, contrary to popular belief, *DataVision* does in fact install itself on the icon bar, co-existing with all other desktop applications that are so installed, and it does not permanently take over the machine.

Extensive facilities for transferring data to and from other Risc OS applications are provided as well.

The package can also use the full screen area for maximum data display, uncluttered high speed data access and, most importantly, secure access to datafiles which cannot be corrupted by other badly behaved applications. So we believe that the *DataVision* interface supplies the best of both worlds.

Y Nadiadi
Silicon Vision

TALKING SHOP

After having my old BBC repaired for the fourth time I thought it was time to upgrade to a new machine. So I bought an A3000 and monitor.

Unfortunately it was not from my local Acorn dealer but from a high street chain instead.

I was annoyed at the way the Acorn computers were tucked away in the back of the store.

When I asked the shop assistant why this was so, he said that there was not much of a demand for these computers and if I was going to take computing seriously I should think about buying an Amstrad or Amiga. I was not in any mood to educate the assistant so I bought the computer and left.

After playing with the machine for a while I felt it was time to look for some add-ons and some good software.



A3000: why hide it away?

My first purchase was a 1Mb upgrade, a must if you want to use the multi-tasking capabilities of the machine to the full. I ordered it by credit card from Morley Electronics and it arrived three days later by post – a very good service indeed.

Among the programs I purchased were titles such as *Atelier*, *Corruption*, *Zarch* and *Interdictor*. All were ordered by credit card from Software Bargains, which again offered an excellent service.

On a closing note, there is one thing I really hate and that is talking to an answering machine. So all companies who have these machines, could you not use them during normal working hours? The personal touch can mean so much, especially when purchasing expensive computer goods.

Graham Walters
Beckenham

PETTING YOUR ARC

I note the advice given to Mr Barnes-Cook in the June 1990 issue of *BBC Acorn User*. I still run a Commodore system as a



Will it talk to an Arc?

wordprocessor and can confirm the difficulties described. For everything else I use an Arc 310.

However, there is another aspect. As a wordprocessor, my 4032 PET and its disc drive have accumulated a great deal of correspondence files.

Perhaps the most serious problem with transferring files from *Superscript* on the PET to *First Word Plus* on the Arc is the need to translate them. I have seen no suggestion to make this possible, yet the files are Ascii and it should be a lot easier than trying to link a Commodore drive to an Acorn machine.

D A Fagandini
Dulwich

SOFTWARE HYPOCRISY?

I wonder if anyone can clarify the current state of affairs as regards some aspects of software protection. I have noticed that certain companies produce software designed solely for making personal backup copies of packages sold under the strict injunction, and indeed under law, stating that no such backups may be made.

Furthermore, the same companies who sell these ingenious machine code routines often also sell software which states that it should not be backed-up.

I would be interested to know if the people who work at these software houses consider that facilitating the production of illegal copies of their own work, and so losing themselves income, is a worthwhile activity.

The constant development of copying programs with newer, faster and more clever ways of copying other people's hard work is just as well matched by the development of newer, more devious, methods of software protection.

This copying 'war' is illogical in the best of situations, but when it occurs within the confines of a single software producer, my mind boggles.

Mrs W W Freeman
Brighton

It is strange, isn't it? We can't make sense of it either. For those who aren't aware of the situation, however, we should make it clear that copying commercial (meaning non-public domain) programs is illegal, unless the program has been purchased along with a site licence or you have permission from the producer.

Permission can also be granted in the manual by stating that you may back up the program for personal use, while the site licence also dictates that copying and use of the program must be restricted to the confines of the institution it covers. Producing copies to give to friends or indeed sell to other people thus depriving the producer of sales is against the law.

Oak is one of the largest software and hardware companies operating exclusively in the Acorn market, and is market leader in SCSI.

Our R&D teams are dedicated to developing the products of tomorrow as well as supporting existing users.

Today's Archimedes users demand compatibility throughout the range, and to meet their demand, we have developed the SCSIFS filing system, which is totally compatible with Acorn's SCSIFS, works in the same way as ADFS, and is, of course, compatible with third party memory and processor upgrades.

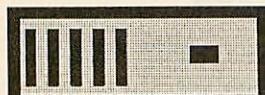
Furthermore, our 16 bit A3000 SCSI card makes full use of the external expansion bus, thereby leaving the eight bit internal expansion bus free for less demanding applications such as user ports and midi cards.

Considerable development work has gone into the software that accompanies our SCSI devices, so that full use is made of the Risc OS environment, and all devices are supremely easy to use. We believe our tape backup software is the best available. It allows file by file back up of information from any filing system, and is particularly suited for network backup.



The long-term view

16 Bit SCSI Controller Card with Peripherals



SCSI 4



SCSI 5



SCSI 6



SCSI 7

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See over for complete range and price list. For further information contact your authorised Oak dealer or ring Oak direct on 0532 502615.

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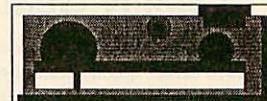
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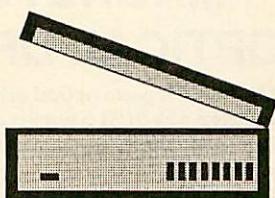
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Scanner

SCSI HARD DISCS

Internal SCSI Hard Disc with Controller Card for all Archimedes 310/400 series computers. Complete with controller card, drive unit, chassis, backplates, 'T' piece, all screws and cables.

HDINARC20SC	20Mb	375.00
HDINARC45SC	45Mb	495.00
HDINARC80SC	80Mb	795.00
HDINARC100SC	100Mb	1114.00
HDINARC200SC	200Mb	1458.00

External SCSI Hard Disc with Controller Card for all Archimedes 310/400 series computers. Comes complete with controller card, connecting cables, backplates, 'T' piece and screws. Housed in a metal case colour matched to the Arc. with switch mode power supply and DC brushless fan.

HDEXARC20SC	20Mb	535.00
HDEXARC45SC	45Mb	655.00
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HDEXARC512SC	512Mb	4085.00

Additional External SCSI Hard Disc Drive. Up to 3 additional drives can be added to the Oak SCSI controller making 4 hard discs in total. For the Archimedes A3000, 310 and 400 series.

HDEXARC20SCA	20Mb	435.00
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HDEXARC300SCA	300Mb	2745.00
HDEXARC512SCA	512Mb	3985.00

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HDA3EX80SC	80Mb	955.00
HDA3EX100SC	100Mb	1274.00
HDA3EX200SC	200Mb	1618.00
HDA3EX300SC	300Mb	2845.00
HDA3EX512SC	512Mb	4085.00

A3000 External Monitor Bridge Mounted Hard Disc Drive with Controller Card. Comes complete with controller card housing, connecting cables. Drive unit housed in monitor bridge, colour matched to the A3000 with switch mode power supply and DC brushless fan.

HDA3BEX20SC	20Mb	565.00
HDA3BEX45SC	45Mb	685.00
HDA3BEX80SC	80Mb	985.00
HDA3BEX100SC	100Mb	1304.00
HDA3BEX200SC	200Mb	1648.00

MAGNETO-OPTICAL DRIVE

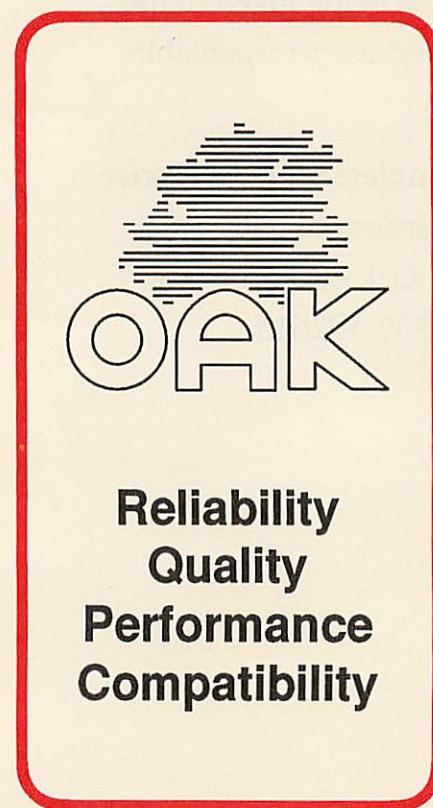
560 Mb SCSI Magneto-optical drive external unit complete with SCSI controller card, data cartridge and cables. Appears as winchester drive to Archimedes.

MAGOPT560	560Mb	4800.00
MAGOPTDISC	data cartridge	300.00

REMOVEABLE HARD DISCS

Removeable high speed cartridge hard disc drives (real hard discs, not slow bernoulli type) Housed in a metal case colour matched to the Arc. with switch mode power supply and DC brushless fan. 42 megabytes capacity per cartridge. One cartridge included in price. 'SC' denotes card included, 'SCA' denotes card excluded.

RDEXARC42SC	A310,A400	1185.00
RDA3EX42SC	A3000	1185.00
RDEXARC42SCA	A310,A400	1085.00
RDA3EX42SCA	A3000	1085.00
RD42CART	disc cartridge	99.00



SCSI TAPE STREAMERS

SCSI Tape Streamer with desktop software to allow easy and versatile backing up and restoring of data from SCSI and ST506 winchesters, networks etc. Comes complete with all cables. Housed in a metal case colour matched to the Archimedes with switch mode power supply and DC brushless fan.

TS60SC (inc card)	60Mb	1099.95
TS150SC (inc card)	150Mb	1354.00
TS60SCA (exc card)	60Mb	999.95
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TAPE60 cartridge	60Mb	24.95
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All Oak hardware is produced under a 'zero defect' quality control regime to ensure the highest possible levels of reliability.

GIGABYTE TAPE DRIVE

R-DST technology providing exceptionally reliable backup of one gigabyte on a tiny DAT cassette. Ideal for image processing, experimental data backup etc.

TSGIGA (inc card)	1Gb	3999.00
TAPE1000 cassette	1Gb	35.00

ST506 HARD DISC DRIVES

Archimedes A410 Internal Hard Disc Drive for use with 'on-board' ST506 Winchester controller. Comes complete with mounting chassis, screws, connecting cables and easy to follow fitting instructions.

HDINARC20ST	20Mb	199.00
HDINARC40ST	40Mb	315.00
HDINARC47ST	47Mb	399.00

Additional External ST506 Hard Disc Drive for A310, A400 Series and R140 computers. For use in conjunction with the 'on-board' or podule based ST506 controller. Comes complete with all cables and connectors to allow neat connection to rear of machine. Housed in its own metal case with switch mode power supply and DC brushless fan.

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HDEXARC40ST	40Mb	524.00
HDEXARC64ST	64Mb	765.00
HD64 (for R140)	64Mb	795.00

Add on drives for SJ Fileserver

POA

A3000 MONITOR STAND

Steel monitor bridge unit colour matched to A3000. Allows access to on/off switch and floppy drive.

A3E10	21.00
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ARCHIMEDES SOFTWARE

PDT - Parametric Design Tool	359.00
PDT - Upgrade PDT release 1 to 2	45.00
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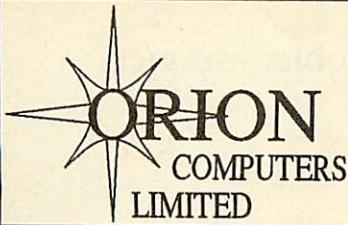
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Delivery charges :	
External Hard Discs/Tape Streamers	15.00
Internal Hard Discs	10.00
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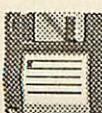
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QUESTIONS AND ANSWERS

Q Looking back at articles and reviews in *BBC Acorn User* I see that there appear to be two desktop publishing programs for the BBC micro published by Advanced Memory Systems - *AMX PageMaker* and *Stop Press*. Are they the same and if not what are the differences between them?

A There is in fact no difference between *AMX PageMaker* and *Stop Press*. The name was changed to *Stop Press* by Advanced Memory Systems to avoid violating the copyright of US publisher Aldus. Aldus' product of the same name runs on the Apple Mac and IBM PC.

Although there have been a number of versions of *Page-Maker* and *Stop Press* they are basically the same with just a few bugs fixed here and there.

The official Master 128 version is loaded into sideways Ram rather than having separate Roms fitted.

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then *BBC Acorn User* can help. The Post A Problem service guarantees to give you a personal answer within 10 working days for just £4.

Write out your problem with as much detail as possible and, if a program is involved, include a disc or cassette. Fill in the coupon at the bottom of this page and send it and your problem along with a cheque or postal order for £4 (including VAT) made out to Redwood Publishing. If you want recorded delivery add on the cost of this.

Please note that debugging readers' own programs or those from other magazines is a complex task and we cannot guarantee to give a full solution. Unless the problem can be spotted quickly, the Post A Problem service will only be able to make general comments. The service will answer the problem and return all material received within 10 working days of receipt. If we fail to match this promise then your cheque or postal order will be returned - you can't lose!

Q I have recently purchased a Casio SF8000 Digital Diary with the FA100 interface kit. I intended using this interface kit with my Archimedes when running the *PC Emulator* under it.

However, I have been having some difficulties. Could you suggest what hardware problems could be causing this?

A If your program expects CGA graphics, this emulation works well with the standard Acorn colour monitor, but any programs expecting an EGA or Hercules graphics card will be disappointed.

I wonder if your program has been written to work within the memory available under the *PC Emulator*. No program that uses extended memory above 640K will operate. Don't forget to check that you have your Archimedes correctly configured to allow the maximum of about 620K to be available.

Finally, there are a number of different versions of the *PC Emulator* around. I wonder if you have the latest, which I think is 1.33?

You can get updated versions from your dealer or direct from Acorn. If you do the latter, have it sent recorded delivery.

(Read/write serial ACIA control register and copy).

This call is used if it is necessary to program the ACIA directly, such as when implementing non-standard RS232 formats, as detailed in Part 1 of the Master Reference Manual on pages D.2-47 and 48.

Q I know that with a BBC Master 128 you can alter the configuration of the RS232 port. Can you expand on what the possible configurations are and how you achieve them?

Also is it possible to configure non-standard RS-232 formats?

A It is very easy to configure the RS232 port on the Master 128. You have to use the *CONFIGURE DATA <D> command. With this you can specify the data format used by the RS232 interface according to the specified value of n.

The acceptable configurations are:

Value	Word	Parity
Stop		
07	even	2
17	odd	2
27	even	1
37	odd	1
48	none	2
58	none	1
68	even	1
78	odd	1

It is possible to implement non-standard RS232 formats with the Master 128.

This is achieved by using the OSBYTE call. OSBYTE 156 (&9C)

Q I've just got myself a bargain, as someone moving on from their Archimedes A310M sold it to me at a bargain price. Unfortunately it still has the Arthur operating system. Can this be upgraded and if so how? I'm also having problems with the serial port. I heard from a friend that it needs a fix.

A You ought to upgrade to Risc OS as soon as possible. You can fit the four chips yourself and they can be obtained from dealers like Norwich Computer Centre, 18 Mile End Road, Norwich, NR4 7QY for about £35.

In early versions of the Archimedes, there were problems with serial devices. But the serial port now works fine under Risc OS.

Q I have recently purchased a secondhand BBC micro for our school. It has an issue 4 board which has been upgraded in various ways. When I switch it on it does not give the usual BBC Computer Acorn DFS message. Instead the message refers to a Watford

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OFFICE USE ONLY Date in:

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Answered by:

double density DFS being installed. Will this cause us problems with running educational software?

A The Watford Electronics DDFS disc filing system you have can be described as being broadly compatible with the Acorn DFS. It does have some different, extra features, which should be explained in the manual. If you were not supplied with one, Watford Electronics should help.

Q Can you tell me what the pin-outs mean on the Archimedes' serial port?

A The serial port on the Archimedes and BBC A3000 uses a nine-way D-type plug. The pin-out is as follows:

Pin	Acorn	Meaning
1	DCD	Data Carrier Detect
2	RxD	Receive Data
3	TxD	Transmitted Data
4	DTR	Data Terminal Ready
5	OV	Common Return, Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear to send
9	RI	Ring Indicator

Pin one is top left and pin nine is bottom right looking into the back of the Arc.

Q I am having disc drive operation problems. When loading games from disc I never have trouble. When loading and saving text with Wordwise Plus everything is alright too.

A But when I am using the Viewstore database package I keep getting disc errors. What is the cause of this?

A Your letter seems to indicate that the problems you are experiencing only occur when using programs that read and write to and from the disc over an extended period.

For instance, database packages like Viewstore access the disc for quite long periods when reading records into the computer's memory and if, for instance, the heads of the disc drive are out of alignment or the disc drive heads are worn a

CRC error will be given.

With normal program loading, say when loading a simple game or saving text with a wordprocessor, the alignment or quality of the head's condition will not be as crucial and so no CRC error will occur.

You should take your drive for servicing. Ask the dealer to check alignment and head wear.

But before you do this I suggest you do try experimenting with the Disc Access Timings which control things like step time, settlement time, and head load time. These can be altered by software using various *FX commands. The commands are:

*FX255,0,207
*FX255,0,223
*FX255,0,239
*FX255,0,255

Remember they do not take effect until after a soft break and remain until a hard break.

Q I am having problems getting the underline command in Wordwise Plus to print correctly using the Taxan/Kaga printer. Can you help me?

A First you ought to check that you are entering the US and/or UE commands correctly with the f1 and f2 keys.

The special embedded commands like US, UE, DS, and DE are set within Wordwise Plus to be compatible with the Epson MX and FX series of printers. The Canon you have is highly compatible and its only real difference is the near letter quality font which uses a different escape sequence to that of 'true' Epson printers.

So there is no reason why you should experience any problem with the Taxan/Kaga printer, but it will depend on you having the printer's internal Dip switches set correctly.

In order that you can check your Dip switches I list below the setting on our Taxan/Kaga:

Power Supply to this side
1 ON 1 OFF 1 ON 2 OFF 2
OFF 2 ON 3 OFF 3 OFF 3
OFF 4 ON 4 OFF 4 OFF 5 OFF
5 ON 6 OFF 6 OFF 7 OFF 7
ON 8 OFF 8 OFF

ACORN CUSTOMER HOTLINE

Registration forms are supplied with all Acorn's computers, peripherals and the majority of software packages for the Archimedes or BBC A3000 series. Please remember to fill in and return the registration forms. Doing this, you register your computer for warranty, so if your computer fails, a speedy repair can be done.

● Acorn has released another Font pack for use with the Risc OS Font Starter Pack, Acorn Desktop Publisher or any third party application which uses the Acorn Outline Font Manager. Called the Symbol Font Pack it contains a completed Symbol (ZapfDingbats) font and the Sidney (Symbol) font. The Symbol Font Pack costs £51.75 and its stock code is SKF03.

● Acorn has developed a Risc OS application, !Teletext that allows Teletext adapters on Econet networks to be accessed from Acorn Archimedes and BBC A3000 systems. !Teletext runs within the Risc OS desktop environment, displaying full teletext pages in a window. !Teletext can be obtained from the schools closed user group area on SID (Acorn's Support Information Database).

Users of SID who wish to access the Schools Information Service should write on headed school paper quoting your SID ID to the SID Editor, at our Fulbourn Road address.

● First Word Plus Release 2 is supplied with a !Run file that will take whatever free memory is available in the Next slot of the Task Manager. When you switch your Archimedes or BBC A3000 on the Task Manager sets the Next slot to 640K which on a 1Mb system is almost all the available memory. It is however possible to change the !Run file of 1st Word Plus

to take only a set maximum amount of memory. This can be achieved by loading the !Run file in !Edit and then scrolling to the bottom of the file where you will find the command:

WimpSlot -min 416k

Change the command to read:

WimpSlot -min 416k -max xxxx

The parameter xxxx can be any value over the minimum requirement for *First Word Plus* to start, which is 416k, so the command could look as follows:

WimpSlot -min 416k -max 564k

The file can then be resaved back into the *First Word Plus* directory. Ensure you have backup copies of the software.

● A number of people have problems attempting to print the text they create in !Edit. To print text you must first ensure the correct printer driver is loaded. Then bring up the save text dialogue box within !Edit then, instead of dragging the file to a filer window, drag the file over the printer driver icon on the icon bar. The printer driver will understand that it is pure text and will print it as such. If you have a text file on disc which you wish to print, then simply drag it from the filer window over the printer driver icon.

● Archimedes and BBC A3000 software which works outside the desktop will quite often reconfigure the computer, unplugging various modules and resetting various CMOS Ram settings. If it does not, set the computer back to its original state, then error messages such as SWI &XXXXXX not known will occur. There are two types of reset which will return the computer back to a state where it is usable. The first is an R Power On, which simply involves holding down the R key while switching on the computer. This will reset the machine except for the number of floppy drives, the number of hard drives, the country setting, Econet station number and the bytes of CMOS relating to the expansion cards. The other reset is a Delete power on. This resets the whole machine except for the Econet station number.

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Visual rescaling of either X or Y axis, X & Y flips, colour tinting, picture cropping, on screen help, etc. RISC OS's anti aliasing feature is utilised to enhance the image quality.

Scanned images can be saved as sprite file or dragged into other applications. The images can be output to compatible printer as a sprite using one of the RISC OS versatile printer drivers.

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technoCAD for Master 128

The best feature of technoCAD is not its outstanding performance, not its unique ability to allow creation of complex icons, not the quality of output from printers or plotters. The best feature is the unprecedented ease with which it can be mastered. With easy to use single key commands limited to three keys, pull down menus and a clear and concise, easy to read manual, technoCAD is truly the system any one can use.

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Computer Aided Draughting System for BBC B

Novacad can drive a plotter to produce drawings of highest quality ... Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use.

Beebug Dec 86

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*All current single rail eproms handled
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for Master & BBC **£89(b)**

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(c) £2.00
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Archimedes EXPANSION OPTIONS

NEW LOW PRICES ON RAM UPGRADES

400/1 RAM UPGRADES

1Mb RAM upgrade (410/1)	£79(c)
2Mb RAM upgrade (420/1)	£158(b)
3Mb RAM upgrade (410/1)	£235(b)

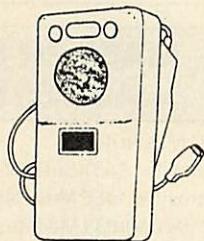
400/1 RAM and Drive Packs

1Mb + 20Mb HD	£239(a)
1Mb + 40Mb HD (Toshiba)	£355(a)
3Mb + 20Mb HD	£389(a)
3Mb + 40Mb HD (Toshiba)	£479(a)
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All the above upgrade packs come complete with cables, brackets and fitting instructions. Hard drives are ready formatted.

TRACKER BALL

A sturdy, high quality tracker ball is now available to replace the Archimedes mouse. You will no longer run off your mouse mat and at the same time you can save the valuable desk space. The tracker ball is fully compatible with the Arc mouse driver. £47(c)



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Both units separately cased with external PSU for the drive.

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SCSI HD Controller	£299(a)

Internal ST506 drives for 410 supplied complete with mounting bracket, cables & instructions

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Auto parking for ease of use.

Techno 50Mb 28 ms	£369(a)
External ST506 HD as 2nd HD	£249(a)

20Mb (cased & psu, cables)	£379(a)
50Mb (cased & psu, cables)	£449(a)

External HD adaptor plate (300/400)	£30(c)
-------------------------------------	--------

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The TechnoRAM Card for the A3000 with either 1MB or 3MB on board, allows you to expand up to 2 or 4MB. 1MB version upgradeable by us to 3MB. Totally compatible with Econet upgrades.

1MB technorAM £79(c)

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Acorn Philips 14"	£239(a)
Colour Monitor	£220(a)

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MultiSync 14" colour, ideal for Archimedes hi res modes. Our price includes tilt & swivel stand.

£429(a)

VIKING II 19" Hi Res.

White screen for CAD applications with tilt & swivel stand.

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A3000 EXPANSION

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Wild Vision Chroma 220	£155(b)
Wild Vision Chroma 235	£199(b)
Wild Vision Chroma 250	£355(b)
Acorn MIDI/User port	£49(b)
Chromatext	£39(c)
XAT Video Utilities Package	£79(c)
MultiPod	£145(b)
technoSCAN	£175(a)
Tracker Ball	£47(c)
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High quality SCSI drives with ACORN's SCSI controller card.

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External drives are suitable for 300, 400 series and A3000

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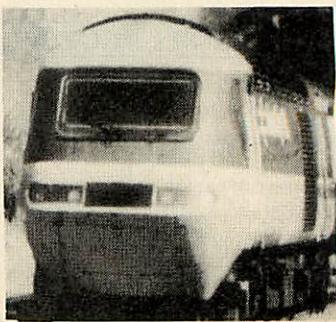
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Professional design and use of latest hardware/software technology have enabled this five function podule to provide the highest quality performance at economical and realistic price. The five functions are fast-scan video digitiser, sound digitiser, serial port, instrumentation/joystick port and 3 BBC compatible ROM sockets.

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best prices

PRINTERS & PLOTTERS

EPSON

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LX850 200cps superdraft 30cps NLQ £209(a)
FX850 264cps draft 54cps NLQ £319(a)
FX1050 as FX850 but wide carriage (132 col) £409(a)

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LQ550 180cps draft 60cps LQ £279(a)
LQ850 264cps draft 88cps LQ £465(a)
LQ1050 as LQ850 but wide carriage (132 col) £575(a)

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High speed 9 and 24 pin printers with colour option fitted:
EX800 300cps draft 60cps NLQ £429(a)
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LQ860 as LQ850 but with colour £529(a)
LQ1060 Wide carriage version of LQ860 £649(a)
LQ2550 400cps draft 133cps LQ £780(a)

Epson Inkjet/Laser Printers

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NATIONAL PANASONIC

KXP1081 + Master Printer Lead £125(a)
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STAR

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LC10 Colour version of LC10 £179(a)
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LC24-15 Wide carriage version of LC24-10 £349(a)
NB24-10 £409(a)

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(*FREE 12 months on site maintenance contract included)

JetRAM Laserjet Upgrades

1Mb £149(a) 2Mb £249(b)
3Mb £339(a) 4Mb £439(b)

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ROLAND A3 8 pen FLATBED PLOTTERS
DXY1100 £549(a) DXY1300 £899(a)
DXY1200 £719(a)
Phone for details of A0, A1 and A2 sizes

PRINTER ACCESSORIES

Serial Interfaces
Epson 8143 £32(d)
Nat Pan KXP17 £39(d)
Epson8148(8Kbuffer) £79(d)

Buffers
32K Buffer IC for P1124/1540 £18(d)

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LX400/800/850, LQ400/550 £69(b)
FX800/850, LQ800/850 £135(a)
LC10 £55(b) LC24-10 £89(b)
Brother HR20 £209(a)
KXP1124 £88(b) KXP1540 £179(a)

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LQ800 £49(b) LQ1000 £55(b)
LQ850 £70(b) LQ1050 £85(b)

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A new style printer stand with easy paper feed and paper separation, provides complete access to paper. Can be used with both top and bottom paper feed. Very space efficient. £22(b)

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*All models carry a BABT Approval

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5.25" Discs in packs of 10
744 40T SSDD £5(d)
745 40T DSDD £5(d)
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Library Cases:
10 x 5.25" £1(d) 10 x 3.5" £1(d)

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LC10 Colour £6.50(d)
LC24-10 £5.00(d)

National Panasonic
KXP1081 £3.50(d) KP1124 £6(d)
Taxan KP810/815/910/915 £5.00(d)
Juki 6100 £1.80(d)
Integrex Black Cartridge £10.50(d)
Integrex Colour Cartridge £16(d)

Plotter Pens:
Roland 4 pen set. (water/oil) (various sizes) £7.50(d)
EX800/EX1000 Colour Kit £15(c)

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Plain fanfold woodfree paper with microperforations:
2000 sheets: 9.5" x 11" 60gsm £13(b)
1000 sheets: 9.5" x 11" 60gsm £7(c)
1000 sheets: A4 80gsm £13(b)
A4 90gsm £14(b)
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50 sheets Art paper 115gsm A4 £3(c), A3 £5(c)
Integrex Paper Roll Std: £9(d)
High Quality: £18(d)

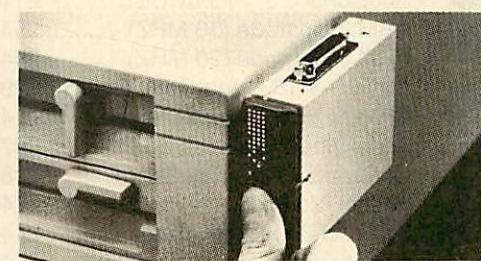
Labels/1000

Single Row 3 1/2 x 1 7/16" £6.75(d)
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Smart Printer Buffer 256K
256K parallel buffer with facilities for 256 copies, PAUSE, RESET & SELF-TEST £149(b)

Compact Two Way Switch
An economical solution for connecting two computers to one Printer or one computer to two printers. Easily attaches to the side of computer or monitor (specify parallel or serial) £19(c)



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(All lines are switched).
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3 computers to one printer £30(c) £30(c)
4 computers to one printer £36(c) £36(c)
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Cable sets for above sharers available for all popular computers

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A 3000 Learning Curve *	£699
A 410/1	£1099
A 420/1	£1499
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* Pack includes PC Emulator, 1st Word Plus, Genesis, Learning Curve Video and literature.

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100 Mb Internal Hard Disc	£995
200 Mb Internal Hard Disc	£1260
20 Mb External Hard Disc	£485
45 Mb External Hard Disc	£565
80 Mb External Hard Disc	£825
100 Mb External Hard Disc	£1085
200 Mb External Hard Disc	£1425
300 Mb External Hard Disc	£2199
512 Mb External Hard Disc	£2865
560 Mb Magneto Optical Drive	£3475
42 Mb Ext. Removable Hard Disc	£999
60 Mb Tape Streamer	£860
Tape for above	£22
150 Mb Tape Streamer	£1249
Tape for above	£25
1 Gb Tape Drive	£3299
Tape for above	£30
for additional devices deduct	£100

Archimedes A400

5.25" Ext. floppy disc interface	£30
Additional 3.5" Floppy Disc	£119
ARM 3 Upgrade (30 MHZ)	£545
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ArVis S-VHS Encoder Board	£145
ArVis Video Graphics Board	£877
Chroma 345 Overlay Board	£389
Econet Module	£46
Ethernet Expansion Card	£449
Floating Point Expansion Card	£549
Hawk V9 Video Digitiser	£339
I/O Expansion Card	£79
Midi Upgrade to I/O Exp. Card	£27
Midi Expansion Card	£65
Midi Upgrade Rom	£14
Rom Expansion Card (CC)	£45
Rom Exp. Card with Battery (CC)	£65
Scanlight Junior Scanner (CC)	£179
Scanlight Senior Scanner (CC)	£389
Sheet Feeder for above (CC)	£95
SCSI Expansion Card (Acorn)	£299
VIDC Enhancer	£29

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Dabhand 410/1 to 420/1

Acorn A410/1 upgraded to A420/1 specification using only the highest quality Samsung Ram and Oak's "Zero Defect" 20 Mb Seagate ST 125-1 28ms drive formatted and tested for guaranteed trouble free use.

A410/2 20 Mb

£1099

Colour System

£1289

Eizo 9060 SZ System

£1558

Dabhand 410/1 to 440/1

Acorn A410/1 upgraded to A440/1 specification using Oak's 47 Mb Rodime 28ms drive formatted and tested as above.

A440/1 specification

£1349

Colour System

£1538

Eizo 9060 SZ System

£1808

Oak 410/1 ST506 Hard Disc Drives

Archimedes A410 Internal Hard Disc Drives for use with 'on-board' ST506 winchester controller. Comes complete with mounting chassis, screws, connecting cables and easy to follow fitting instructions.

20 Mb 28ms

£169

40 Mb 28ms

£285

47 Mb 24ms

£345

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Fast Samsung Ram complete with step by step fitting instructions.

1 Mb Ram

£65

2 Mb Ram

£120

3 Mb Ram

£175

A410/1 Series Ram and Oak Drive Upgrades

Up to 2 Mb Ram + 20 Mb

£229

Up to 2 Mb Ram + 40 Mb

£349

Up to 2 Mb Ram + 47 Mb

£409

Up to 4 Mb Ram + 20 Mb

£339

Up to 4 Mb Ram + 40 Mb

£459

Up to 4 Mb Ram + 47 Mb

£519

Dabhand Art/CDT Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Atelier or Pro Artisan

WorraCAD

RISC OS Extras & Utils Discs

Box of discs, printer cable and mouse mat

A410/2 Art/CDT Pack

£1219

Colour System

£1408

Eizo 9060 SZ System

£1678

Dabhand DTP Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Impression & Scanlight Junior

Atelier or Pro Artisan

RISC OS Extras & Utils Discs

Font FX, Box of discs, printer cable and mouse mat

A410/2 DTP Pack

£1439

Colour System

£1628

Eizo 9060 SZ System

£1898

Dabhand Business Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Impression & Scanlight Junior

Pipedream

RISC OS Extras & Utils Discs

Font FX, Box of discs, printer cable and mouse mat

A410/2 DTP Pack

£1469

Colour System

£1658

Eizo 9060 SZ System

£1928

Additional upgrades for Dabhand Packs

Up to 4 Mb Ram

£120

Up to 40 Mb Hard Disc

£116

Up to 47 Mb Hard Disc

£176

Up to 4 Mb Ram + 40 Mb

£236

Up to 4 Mb Ram + 47 Mb

£296

Please add these prices to the base system prices quoted above.



Floppy Disc Drives

5.25" Single 40/80 no psu	£95
5.25" Single 40/80 with psu	£109
5.25" Dual 40/80 no psu	£185
5.25" Dual 40/80 with psu	£199
3.5" Single with psu	£85
3.5" + 5.25" 40/80 no psu	£185
3.5" + 5.25" 40/80 with psu	£209

Monitors

Acorn badged Colour	£199
EIZO 9060SZ Multisync	£465
Philips CM8833	£225
Taxan 775 Multisync	£425

All monitors come with free lead. State type of computer when ordering.

Dabhand A3000 Series Expansion Options

A3000 Art/CDT Pack

Acorn A3000 upgraded to 2 Mb of memory complete with:-

- Atelier or Pro Artisan
- WorraCAD or KiddiCAD
- Oak monitor stand and expansion bridge
- Acorn Colour Monitor
- RISC OS Extras & Utils Discs
- Box of discs, printer cable and mouse mat

A3000/2 Art/CDT Pack £999

A3000 DTP Pack

Acorn A3000 upgraded to 2 Mb of memory complete with:-

- Atelier or Pro Artisan
- Impression & Scanlight Junior
- Oak monitor stand and expansion bridge
- Acorn Colour Monitor
- RISC OS Extras & Utils Discs
- Box of discs, printer cable, Font FX and mouse mat

A3000/2 DTP Pack £1299

Oak A3000 Expansion System

Monitor Stand	£21
System Housing	£35
18 Watt PSU (Floppy Disc Drives)	£30
55 Watt PSU (Hard Disc Drive)	£79
90 Watt PSU (Hard Disc & Tape)	£89
Fan Kit	£15
3.5" Floppy Kit	£94
5.25" Floppy Kit	£84
20 Mb SCSI + Controller	£385
45 Mb SCSI + Controller	£505
80 Mb SCSI + Controller	£805
100 Mb SCSI + Controller	£1124
200 Mb SCSI + Controller	£1468

Ring for details of full range including Tape Drives, Removable Hard Discs.

A3000 SCSI Devices

20 Mb External Hard Disc	£485
45 Mb External Hard Disc	£565
80 Mb External Hard Disc	£825
100 Mb External Hard Disc	£1085
200 Mb External Hard Disc	£1425
300 Mb External Hard Disc	£2199
512 Mb External Hard Disc	£2865
560 Mb Magneto Optical Drive	£3475
42 Mb Ext. Removable Hard Disc	£999
60 Mb Tape Streamer	£860
Tape for above	£22
150 Mb Tape Streamer	£1249
Tape for above	£25
1 Gb Tape Drive	£3299
Tape for above	£30

A3000 Upgrades

User & Midi Podule	£46
Serial Upgrade	£19
Monitor Stand (Acorn)	£29
Monitor Stand (Pres)	£24
5.25" External floppy disc cable	£15
5.25" External floppy disc buffer (Pres)	£46
Serial Link Kit (BBC-Arc)	£14
Dust cover (Keyboard + Monitor)	£12

Software

Acorn Desktop Publisher	£109.95
ANSI C V.3 Compiler + free C Front	£139.95
Apocalypse (3D Space Game)	£24.95
Arc DFS (DFS Filing System)	£26.04
Arcade Soccer	£14.95
ArcComm (BBC Soft)	£24.95
Armadeus (Sound Sampler)	£69.95
Armadeus (Sampler Board)	£139.00
Artisan 2 (16 Colours)	£49.95
Atelier (Minerva 256 Colours)	£79.95
Battle Tank (Minerva)	£12.95
Casino (Minerva Desktop Games)	£14.95
Caverns (Minerva Arcade Game)	£17.35
C-Front (Mitre Front End for ANSI C)	£17.35
Clip Art for Draw/Impress (Midnight Graphics)	£29.95
Colour Printer Sprite Dumps (Midnight Graphics)	£26.04
Disc Tree 2 (Mitre Hard Disc Utility)	£39.95
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E-Type (Driving Simulation)	£14.95
E-Type 100 Miles / Designer ea.	£14.95
Family Favorites (Minerva Compilation)	£14.95
First Word Plus V2 (Acorn)	£79.95
Fireball 2 (Superhero breakout clone)	£24.95
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Genesis (Hypermedia System)	£79.95
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Stranded (Robico Adventure)	£23.95
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Talisman (Minerva Graphical Adv.)	£12.95
The Guild of Thieves (Mag. Scrolls Adv.)	£26.04
The Pawn (Magnetic Scrolls Adventure)	£26.04
Thundermonk (Arcade Adventure)	£14.95
Trivial Pursuit (Board game)	£24.95
U.I.M. (Submarine Battle)	£24.95
Worra Battle (Oak Tank Battle)	£14.95
Worra Plot (Draw/HPGL Plotter Driver)	£24.95
World Class Leader Board (U.S. Gold)	£19.95

Printers

Citizen 120D+ (Serial add £20)	£129
Citizen Swift 9	£195
Star LC10	£139
Star LC10 Colour	£179
Canon Bubblejet BJ-130E	£539
Citizen Swift 24	£259
Colour Kit for above (also Swift 9)	£39
Sheet Feeder for Swift Range	£89
Star LC24-10	£209
Integrex Colourjet 132	£519
HP Paintjet	£795
LASER DIRECT (CC)	£899
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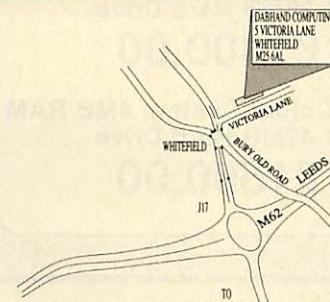
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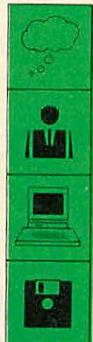
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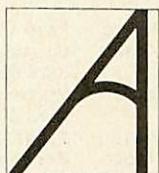
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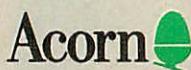
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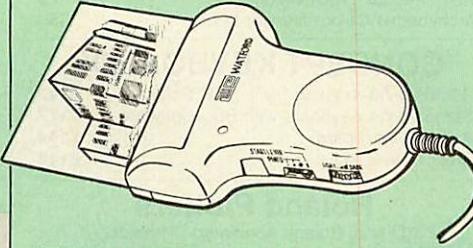
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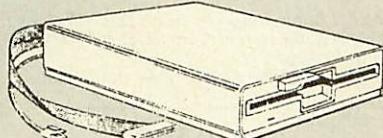
When Acorn originally designed the Archimedes micro, they released to all interested parties the specification of the expansion podule. This has now become the accepted standard for all manufacturers of Archi peripherals. The A300 & A400 both allowed expansion internally up to 2 or 4 podules. However, a newcomer to the array has caused some upset. A3000 has only a single podule expansion slot, on the outside. There has been deliberation in the industry about a controversial "mini-podule" to be fitted to a special rack. This would entail a re-design of all the available podules onto a smaller board and understandably the manufacturers have rejected the idea completely. As always, Watford have come up with the only real solution to the A3000 expansion problem. The Ultimum Podule Racking System allows up to 3 full size standard A300/A400 series podules to be fitted to the computer. There is also provision for a hard disc drive and podule. Ultimum has its own PSU. There is also an IEC mains output socket for a monitor. It mounts on top at the rear of the computer, and allows direct access to the floppy drive and reset button, rather than obstructing access as on other non standard systems.

Watch this space for launch details.

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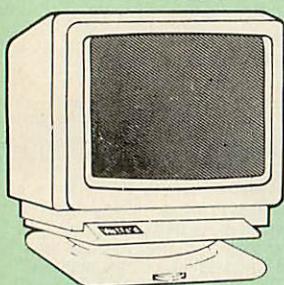
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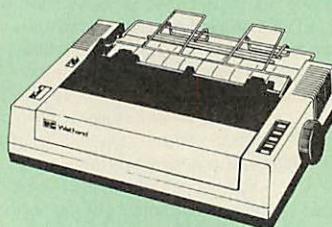
Standard A3 Keyboard with BBC Software	£143
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FREE
MAINTENANCE
ON SITE

SALE OFFER only: £127

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every KX-P1081 printer purchased from us)

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer lead.

Offer Price £136

Panasonic Printers

• KX-P1124 24pin 80col. 192/63 CPS	£215
• KX-P1540 24pin 136col. 240/80 CPS	£415
• KX-P1592 9pin 136col. 216/45 CPS	£275
• KX-P1595 9pin 136col. 288/61 CPS	£345
• KX-P1624 24pin 132col. 192/63 CPS	£349
• KX-P1640	£349
• KX-P1695 9pin 132col. 330/86 CPS	£349

Panasonic KX-P4450i LASER PRINTER

Latest technology at Watford's special offer price £1,225

• Spare Toner	£29	• A4 Feeder	£55
• Drum Unit	£149	• Developer	£115

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

BUFFERS

P12 4K buffer Board for 1081	£55
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P42 32K buffer Chip for 1592/1595	£16
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P43 32K Buffer Chip for 1540/1124/1180	£16
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Serial Interfaces

P17 P1081/1592	£32	P19 P1124/1180	£55
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Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595	£8
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P115 for KX-P1180	£8
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P145 for KX-P1124	£8
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P140 for KX-P1540	£10
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Colour Ribbons for KX-P1081, 1592 & 1595

Brown, Blue or Red £9.95 each

NEC Ribbons for P6+ £8.50; P7+ £9.50

INTEGREX COLOUR JET

• Colour Jet 132 Printer	£515
• Paper Roll	£6.50
• Screen Dump Software	£10
• Colour Cartridge	£19.50
• Colour Textile Cartridge	£29
• Black Cartridge	£11.25
• Black Textile Cartridge	£17
• 100 A4 OHP transparencies	£55
• 8K Serial Interface Optional	£123

Citizen Printer

120D Plus	£105	Swift 9	£198
Prodot 9	£275	Prodot 24	£375
Swift 24	£245		
Swift 24 Colour Option		£34	
Swift 24 Colour Ribbons		£13	

12
MONTHS
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MAINTENANCE
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Hewlett-Packard Printers

HP Desk Jet +	£549
HP Desk Jet Cartridge	£14
HP Desk Writer	£669
HP Laserjet IID	£845
HP Paint Jet Colour	£699
HP Quiet Jet Plus	£425
HP Scanjet Plus	£1199
HP Thinkjet	£269

Star Printers

• LC10 9pin 80col. 144/36 CPS	£124
• LC10 Colour 9pin 80col. 144/36 CPS	£160
• LC10-II 9PIN 80col. 180/45 CPS	£155
• LC15 9pin 136col. 180/45 CPS	£258
• LC24-10 24pin 80col. 180/60 CPS	£189
• LC24-15 24pin 136col. 200/67 CPS	£320
• XB24-10 24pin 80col. 240/80 CPS	£379
• XB24-15 24pin 80col. 240/80 CPS	£489
• XB-24 Colour Kit	£35

Star Accessories

Cut Sheet Feeder	
LC10/LC24-10	£65
XB24-10	£80

12
MONTHS
FREE
MAINTENANCE
ON SITE

LASER PRINTERS

Canon LBP-4	£849
Canon LBP-8 III	£1375
Canon LBP-8 IIIT	£1739
Canon LBP-8 IIR	£1869
Epson GQ5000	£860
HP Laserjet IIP	£795
HP Laserjet IID	£1899
HP Laserjet III	£1249
Panasonic KX-P4420	£949
Panasonic KX-P4450i	£1225
Qume Crystal Print WP+	£775
Qume Crystal Print Ser. 2	£1099
Qume Crystal Print Postscript	£1999
Star LP-8 II	£1149
Star LP-8 II 2 Bin	£1595
Star LP-8 Star(Post)script	£1695

Laser Toners

Canon 2	£60	Laserjet II	£79
Canon 4	£70	Laserjet IIP	£79
Epson GQ	£20	Panasonic	£29
Star	£-	Qume Crystal	£25

Laser RAM Upgrades

HP Laserjet II RAM	GQ5000	512K	£99
Jetware II 1MB	£199	KX-P4420	1M
Jetware II 2MB	£349	KX-P4450i	1M
Jetware IIP 1MB	£199	KX-P4450i	2M
Jetware IIP 2MB	£479		£575

Handy Printer Switch

A handy two way compact printer switch that enables you to connect 2 Micros to 1 printer, or 2 printers to 1 Micro. Attaches easily to your printer, monitor, etc. A low cost solution for educational establishments. Ideal for those wishing to use a dot matrix and a laser printer. Available in two configurations.

Compact AB Switch Centronics	£19
Compact AB Switch RS232	£18
(Cables extra at £6 each)	

MEGABUFFER 256



The Smallest 256K Printer Buffer Unit in the world 38mm x 130mm x 134mm.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr. £5)

Epson Printers

EX800	£429	LQ1050	£540
EX1000	£564	LQ1060	£649
FX850	£315	LQ2550+	£849
FX1050	£385	LX400	£129
FX1060	£679	LX850	£179
LQ400	£198	SQ850	£515
LQ850	£439	SQ2550	£789
LQ550	£269	TLQ4800	£1449
LQ860 Colour	£535		

CUT SHEET FEEDERS for

EX800/FX800/850/LQ800/850	£130
FX1000/LQ1000/1050	£175
LQ2550	£390
LX400/800/850/LQ400/500/550	£69

TRACTOR FEED for

LQ800 £44; LQ850/FX850 £69; LQ1050/FX1050 £85; LQ2500 £90; LQ2550 £90.

ACCESSORIES

• EX800/1000 Colour Option	£45
• EX800/1000 Colour Ribbon	£14
• LQ2500 Colour Option	£65
• Multifont Card for LQ550/850/1050	£95

Epson Printer Interfaces

All these interfaces fit inside the printer	
RS232	£32
IEEE 488	£40

RS232 + 2K Buffer

RS232 + 8K Buffer

£79

£52

£40

£79

£52

£40

£79

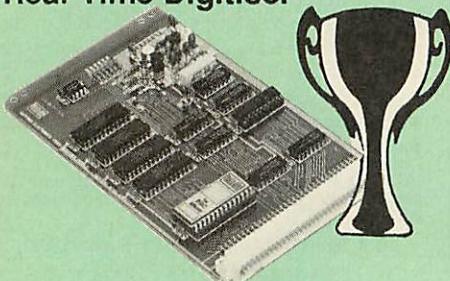
P.O.A.

£52

£40

£79

Archimedes Real-Time Digitiser



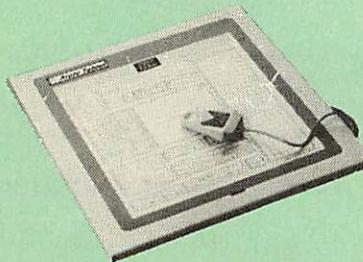
Now supplied with NEW RISC OS Version Software

Watford's Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £215

A Set of Colour Filters for colour image grabbing using a video camera £16
New Risc-OS Software Upgrade £39

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic).

(FREE this month, PC Mouse Drivers & Art package)

(For further details, please write in or telephone for our descriptive leaflet).

Special Price £249

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra £29

DISC PLONKER RACK



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

• Watford sophisticated DFS ROM	£16.00
• Watford DFS Kit complete	£69.00
• We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
• DFS Manual (comprehensive)	£6.95
• Acorn DNFS ROM	£17.00
• Acorn ADFS ROM only	£25.00
• Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only £39.00.

- SPECIAL PRICE £44.00
- DDFS Manual (No VAT) £6.95
- We will exchange your existing DFS Kit for our sophisticated DDFS for only £30.00

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor

• 10 x 5.25" S/S D/D 40T (744)	£5
• 10 x 5.25" D/S D/D 40T (745)	£7
• 10 x 5.25" S/S D/D 80 Track (746)	£8
• 10 x 5.25" D/S D/D 80 Track (747)	£9
• 10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT	£13
• 10 x 3.25" S/S D/D 40/80 Track	£9
• 10 x 3.25" D/S D/D 40/80 Track	£8
• 10 x 3.5" Double Sided High Density	£18

**CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383**

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

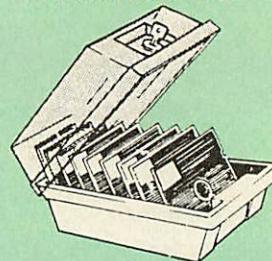
• 10 x M3 3.5" D/S D/D 80 Track	£8
• 10 x M9 3.5" D/S High Density	£17
• 10 x M4 5.25" S/S D/D 40 Track	£5
• 10 x M5 5.25" D/S D/D 40 Track	£7
• 10 x M7 5.25" D/S D/D 80 Track	£8
• 10 x M8 5.25" D/S H/D Hi-Density	£13
• M2 3" Double Sided	£3 each

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

ANTISTATIC LOCKABLE DISC STORAGE UNITS

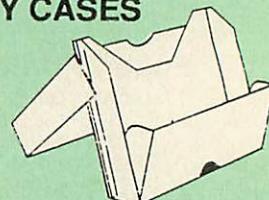


Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 – holds up to 50 5.25" discs £4.95
- M85 – holds up to 95 5.25" discs £6.95
- M25* – holds up to 25 3.5" discs £4.95
- M50 – holds 50 3.5" discs £6.50
- M10 – holds 8 of No. 10 Data Cartridges £15

* Not lockable

PLASTIC LIBRARY CASES



Holds up to 10 5.25" Discs. Only £2.00

DUST COVERS (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

DISC ALBUMS

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special BULK OFFER on 5.25" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)



BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
• Without Sleeves	£30	£35	£40
• With Sleeves	£33	£38	£43

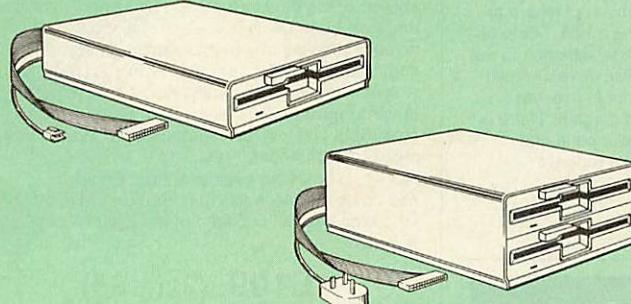
Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below. The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch. All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro. Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal. Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today!).

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 4th page of our advert for the Plinths).

P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £74		CS 400S £83	
800K (1.44M)		CLD 800S £149		CD 800S £162

● TWIN Disc Drive Case, complete with Power Supply & Cables £43
Securicor carriage on Disc Drives £6 to £7

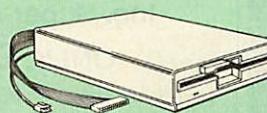
Prefix C = Cased Drive Suffix S = 40-80 Switchable
L = Less PSU
S = Single
D = Double

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.

Refurbished Disc Drives now available
CLS400S £50; CLD800S £98; CS400S £59; CD800S £115

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

Special 40/80 Disc Drive/DDFS Mk II Offer



● The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.

● Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.

● A comprehensive User Friendly Manual.

A Bargain at Only £119 (£7 Carr) (Offer valid while stocks last)

3.5" DISC DRIVE OFFER



These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

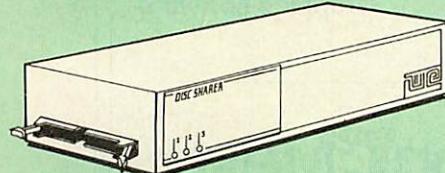
Drives to connect to BBC Micros own PSU
● CLS35 400K Unit £65 ● CLD35 Twin 800K £119

Drives with built-in Power Supply Unit

● CS35 Single 400K £85 ● CD35 Twin 800K £129

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

DISC DRIVE SHARER

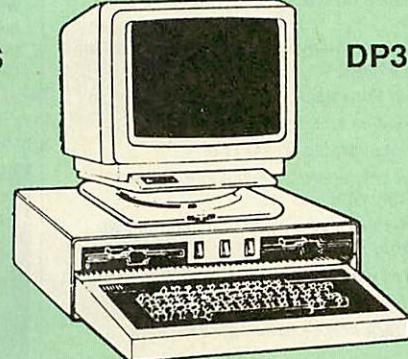


(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Offer Price : £55 Price includes 3 Cables

CDPM 800S



DP35-800S

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £175

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks - now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system - called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk - leaving you more space to work with.

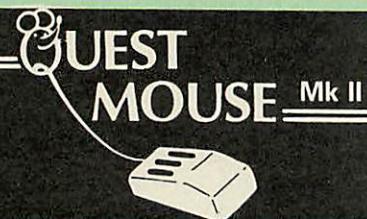
The 5.25" disk drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued → → → → → → → → → →



● Quest Mouse II & Quest Paint	£58
● Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont	£89
● Quest Mouse II only	£29
● Quest Paint Software only	£34
● Quest Font Disc (22 Text Fonts)	£15
● Quest Mouse Mat (Red or Blue or Green please specify)	£3
● Part Exchange your unreliable AMX Mouse for a Quest Mouse for only (P.S. Quest Paint is not compatible with BBC Compact)	£22

Winner of the BBC Acorn User 1990 Award for the Best Art/ Graphics software



ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them. Some of the features are:

- Pick filenames off the screen for loading and saving.
- Rotate a cutout to any angle and Distort it to any four sided shape.
- Has Built in Font editor.
- Default brushes and patterns on startup.
- 16 x 16 font available on startup.
- Ability to reset patterns, fonts and brushes to default at any time.
- ROM based enhanced Epson and compatible printer dump.
- ROM based enhanced extended picture routine.
- Ability to create and abort extended pictures.
- Improved disk access speed for extended pictures.
- User definable sideways RAM driver for incompatible sideways RAM systems.
- Ellipses at any angle on Master 128 (or B with GXR ROM).

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

NEW

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £39

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible) £45
RB2 including Quest Paint £75
RB2-A for Archimedes £46

THE NEW Mk III AMX MOUSE

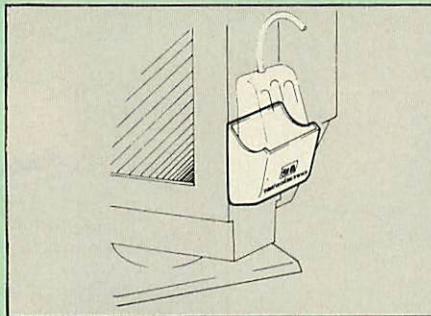
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

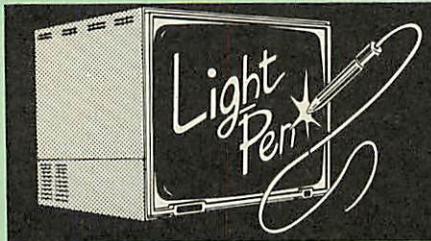
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS - A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS - Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE MOUSE HOUSE



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk. It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils - and at £4 it doesn't cost a rodent's ransom.

Price £4



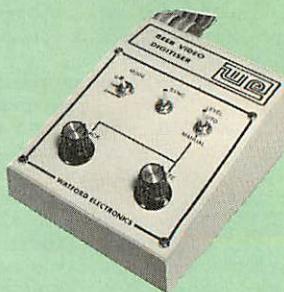
Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics commands in BASIC or other ROMs to work on it. A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

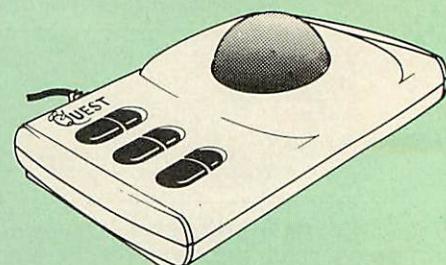
(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

NEW

QUEST - Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version £32

QT-20 Archimedes Version £35



Winner of the
BBC Acorn User
1990 Award for
the Best DTP/
Word Processor

The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine 'microspacing' it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-paste, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be - it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

cont./-

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.

Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independently or from within the Wapping Editor package.

Wapping Editor Software Pack £69
Wapping Editor plus Mouse £89

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware £135

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.

Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.

Supplied complete with instructions.

£12



NEW

Laser Direct

For Archimedes Micro

By using the power of the Archimedes RISC processor, it offers the best of both worlds - print speed up to 5 times faster than typical LaserJet compatibles - uses outline fonts so that any font can be scaled to any size - works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, IDraw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/ envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Launch Offer: £949

(For demonstration, call in at our retail shop)

NEW

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed. Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual. (Will only work on 360K Disk Drives)

Price: £39

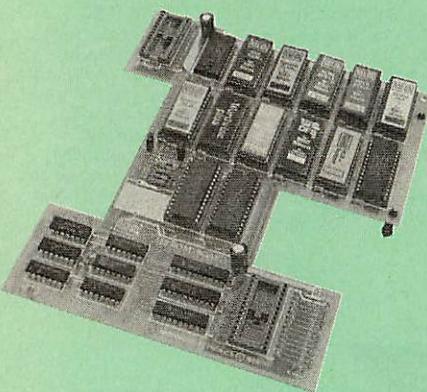
(Please write in for technical literature)

Continued→→→→→→→→→→

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accommodation is available to single persons if required. Telephone Keith Archer or Richard Overfield for interview, or write to us enclosing your CV.

SOLDERLESS SIDeways ROM SOCKET BOARD



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

- Increase your BBC's capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35

Battery Backup fitted £39

Battery Backup only £3

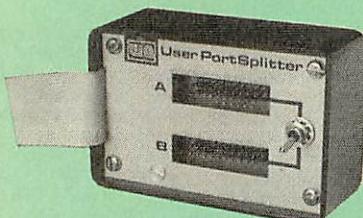
16K Sideways RAM £8.50

(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

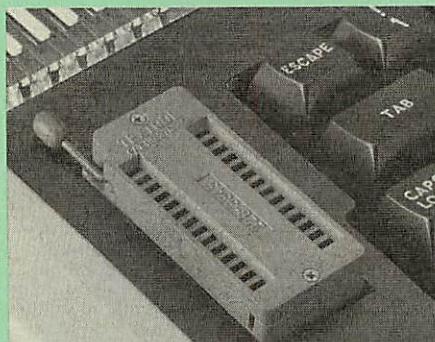
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at £22 (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY £18 (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	£11
● Spare Cartridges	£2.75
● Spare Rack	£1.65

ROM Cartridges for the BBC Master

Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin £9; Quad £14

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: £29 (carr £2)

Optional Battery back-up fitted



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobol, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs from a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro - no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: £59 (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	£36
	Aries B-12C	£5

ARIES B-488 IEEE-488 INTERFACE UNIT

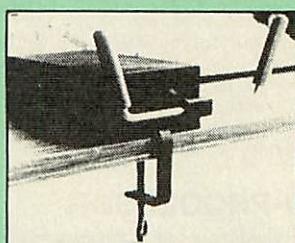
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£15
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£11
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7
Delta-Cat A mouse eliminator Joystick for the Archimedes	£24

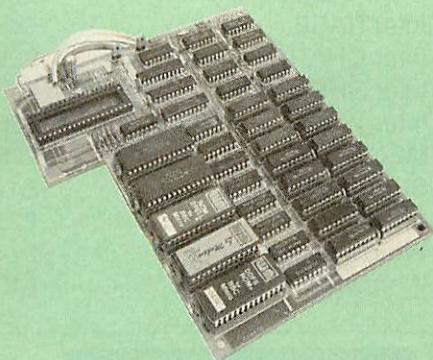
Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128

£25

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEViates crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM £48
- ROM/RAM card with 64k dynamic RAM £65
- ROM/RAM card with a massive 128k dynamic RAM £109

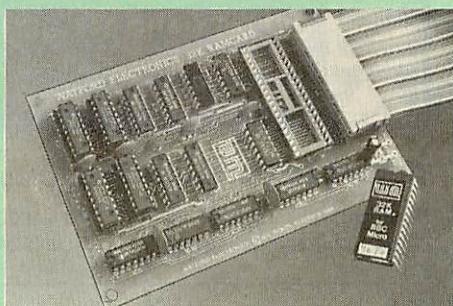
(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £9
- 16k Dynamic RAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches £2 each
- Complete ROM-RAM board
- All options installed £115

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K SHADOW RAM-Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer - type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free - 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well ("FX15,21,138,145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)

(Price includes a comprehensive manual and the ROM)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £18

Watford Electronics are:

- Acorn Qualified Dealer & Econet Referral Centre
- ARIES PC Dealer/Distributor
- Cambridge Computer Dealer
- Epson Silver Centre
- EIZO Monitor Dealer
- Microvitec Appointed Dealer
- NEC Appointed Dealer
- Panasonic Premier Dealer
- Roland Plotter Official Dealer
- Star Printer Sub Distributor
- Taxan Appointed Monitor Dealer
- 3M Media Premier Distributor

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £11.25
- Maths with a Story 2 (Disc). 4 further maths programs £11.25
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs £17.00
- BONDING: Science (Disc) O-Level Chemistry program £20.00
- ELECTROMAGNETIC SPECTRUM (8 Discs) O-Level program £20.00
- ELECTRONICS IN ACTION (Disc) O-Level program £19.95
- NEWTON & THE SPACE SHUTTLE (Disc) O-Level program £20.00
- ECOLOGY (Disc) O-Level program £20.00
- POLYMERS (Disc) O-Level program £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule £20.00
- FOOD & POPULATION (Disc) O-Level program £20.00
- MICROTECHNOLOGY (Cassette) O-Level program £11.25
- DEUTSCH DIREKT! (Disc & Audio Cassette) £19.95
- Modem Master (Disc) £11.25
- ADVANCED TELETEXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20.00
- Astronomy - Primary (Disc) £12.00
- Computers at Work - Primary £17.35
- Introducing Geography 11-17 years £17.50
- Electric Fields 6-14 years £11.25
- Black Queen Contract Bridge £13.00
- Espana Viva - 3 Discs £19.95
- WHITE KNIGHT Chess game £16.00

Educational Software

FUN SCHOOL 2 - Red:

Under 6 yrs - 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic.

£12.00

FUN SCHOOL 2 - Green:

6-8 yrs - Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump

£12.25

FUN SCHOOL 2 - Blue:

Over 8 yrs - Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape.

£12.50

- PUNCMAN Learning punctuation Puncman 1 & 2 for 7 - 13 years £15
- Puncman 3 & 4 for 8 - 14 years £15
- Puncman 5 & 6 for 8 - 15 years £15
- Yes Chancellor - A chance to take over number 11 at Downing Street. 12 years+ £18
- Letters & Pictures - Introduces phonic skills to Infants 6-8 years £15
- Numbers & Pictures - Early number learning is a great fun (4-6 years) £15
- Note Invaders - Budding musicians can learn the notes on the Clef with this elegant game 3 programs (7 to Adults) £15
- Maps & Landscapes No. 1 (9-14 years) £18
- Help Your Child learn Basic Map work No. 2 (9-14 years) £18
- Pirate - Educational Adventure (8-14 years) £15
- Spelling Week by Week (6-14 years) £18

Archimedes Software

- BUMPER DISC £14
- Bumper Disc 2 £14
- Fun School 2A Red (up to 6 years) £14
- Fun School 2A Green (6-8 years) £14
- Fun School 2A Blue £14

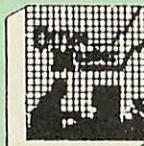
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VIEW 3.0 ROM	£45
VIEW PROFESSIONAL	£50
VIEWSHEET (Acornsoft)	£36
VIEWSTORE	£36
VIEWSPELL with 80 track disc	£25
VIEWPLOT Disc (Please specify for Master 128 or Compact)	£20
VIEW-INDEX	£12
OVERVIEW packs 1 & 2	£65
HI-VIEW	£38

**Watford's own Sophisticated
VIEW PRINTER DRIVERS**

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8

**OFFICE
MASTER**



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only £21 (Disc)

**OFFICE
MATE**



- **DATABASE**
- **BEEBCALC SPREADSHEET**
- **BEEBPLOT GRAPHICS**

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.00
DISC Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc)

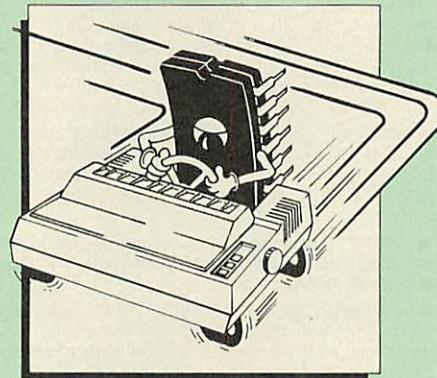


**CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383**

Advanced Computer Products

Advanced Disc Toolkit	£28
Advanced Disc Investigator	£24

**VIEW PRINTER DRIVER
ROM**



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing at only a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, H180, KPB10/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

Price: Only £33

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Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

**The most comprehensive
utilities ROM
for Wordwise-Plus**

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
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- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only £24

(N.B. Word Aid requires a Disc interface in your Micro)

BOOK

**The Complete Mouse
User Guide to BBC Micro**

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

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THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC-B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL – Uses and abuses of computers.

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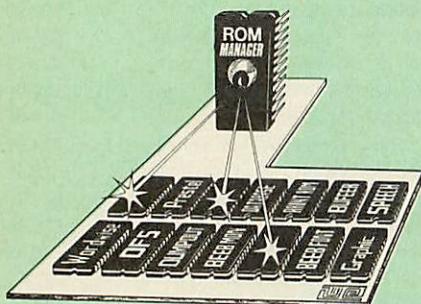
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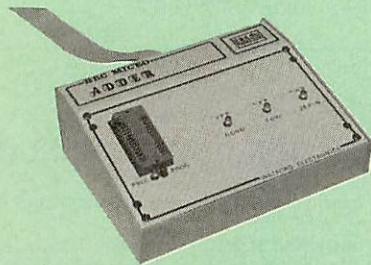


Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V, 27128 EPROMS.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled. The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£65 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- ERASER EB - Standard version erases up to 16 chips. £32 (carr £3)
- ERASER GT - Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. £34 (carr £3) £12
- Spare UV tubes.

Servisol Foam Cleaner

This 415ML, king size multi-purpose foam cleaner spray is ideal for cleaning the Keyboard, Monitor, Disc Drive and your computer furniture surfaces. Simply spray on the surface to clean and wipe off with a clean cloth.

£2.50

Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/ Monitor Screens.

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This simple to use aerosol spray is ideal for removing Dust and Dirt deposits from the Keyboards and similar inaccessible places.

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SPARES for BBC Micro

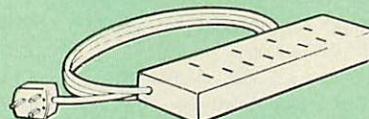
BBC Keyboard	£46	Speaker	£3
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Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage transients spikes/surges caused by lightning or thermostats switching.

Protection for only £8.50

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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals.

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This extremely useful tool allows you trouble free chip insertion and removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

£2

Metal Chip Extractor

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28pin DIL HEADER PLUG

SOLDER type £1.50 IDC CRIMP type £1.95

8 WAY DIP SWITCH

Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ keyboard

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(All ready made and tested)

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DISC DRIVE POWER LEADS

Supply from BBC power supply to standard Disc Drive Connection: Single £3.00; Dual £3.75

DISC DRIVE INTERFACE LEADS

BBC to Disc Drives Ribbon Cable Single £4 Twin £6

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ECONET (5 pin DIN)	35p	50p
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Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below).

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ASSORTED ROMS



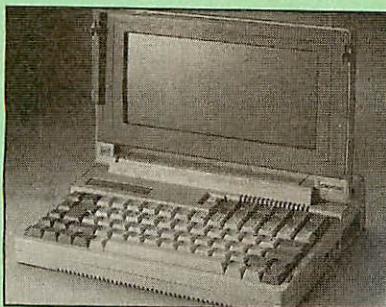
TEX EPROM ERASERS

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ARIES P20-HD PC Portable

Full Desktop PC Power
For People On The Move



Imagine an IBM PC compatible laptop that can fit inside your briefcase (with room left over), so light (just over 7 pounds) that it is easy to carry wherever you go, and a choice between AC and rechargeable battery power, so you could use it anywhere. The Aries portable has made your dream a reality with the world's most powerful compact Laptop. Also it is the FIRST COMPACT PC PORTABLE, incorporating a HARD DISK at under a £1,000.

The Aries portable has an energy-efficient 80C88 micro-processor that runs at 10MHz, a built-in high-capacity high speed, 20MB Hard disk drive, 1MB RAM, an advance LCD display, and a standard full-size keyboard with comfortable tactile feedback. The Aries Portable also has a full complement of six built-in ports (two RS232, one printer, one external FDD, one RGB monitor, one mouse), so you can add on extras wherever you settle down. All of this in a case so compact that it can easily fit inside your briefcase.

In his independent review (Computer Shopper, May 1990), the reviewer writes, - "Overall, the single most outstanding feature has to be the price tag. A notebook PC, with a hard disc selling for below £1,000 has no competition at the moment. If you have a small briefcase, weak arms or just like the concept of a truly portable computer then this is your man".

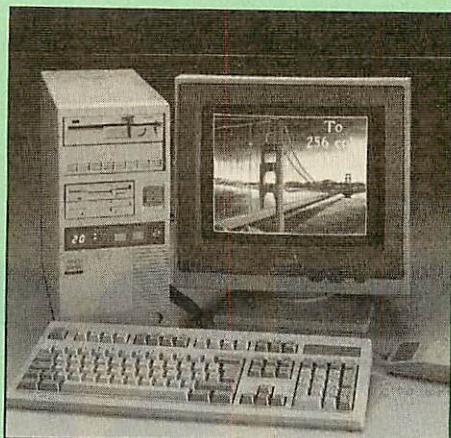
Just read the specification . . .

- **Processor:** 80C86 running at 10MHz Real time clock/calendar
- **Memory:** 1MB RAM (640K, 384Kb LIM/EMS)
- **Drive:** Built-in 2.5" 20MB Hard Disk Access Speed 28ms (optional external 3.5" 1.44MB)
- **Display:** EL backlit transreflective supertwist LCD display, 80 characters x 25 lines, 640 x 200 bit-mapped graphics IBM CGA compatible
- **Std Interface:** Parallel Printer Port. Two RS232C Serial Ports External disk drive port. CGA Colour monitor port External keyboard port or PS/2 mouse port
- **Std Accessories:** AC mains adaptor/batt. charger. External FDD Convertor Battery pack
- **Dimensions:** 12" W x 2.4" H x 8.7" D
- **Weight:** Just over 7lb (incl. H'Disk/Batt.)
- **Power:** Internal removable Ni-cad batt. AC adaptor, 12V DC. Low battery indicator. Battery charge indicator
- **Bundled Software:** MS-DOS 3.3/GW-Basic Watford Drive package (allows data to be transferred with other PC Compatibles via parallel port. PC Organiser Diary, Calendar, WP)

Introductory Offer

● 20 Hard Disc Version	£999
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The Aries PC 386-SX combines many of the powerful features of the 386 system with the frugality of a price tag more at home on a 286 system. With 8/16MHz CPU, this system provides virtually full 386 performance, including the more convenient scheme of memory control that allows easy configuration of expansion RAM as EMS for DOS application.

Features:

- 80386-SX CPU with optional 80287/80387 Maths Co-Processor
- 8/16 MHz selectable speed
- Legal Bios with built-in Setup routine
- For OS/2 and XENIX
- On-Board EMS

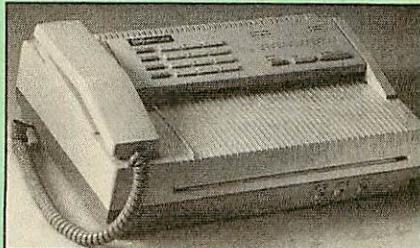
Specifications:

- 1MB RAM on-Board expandable to 16Meg
- 1 x 5.25" - 1.2Meg Drive fitted
- 1 x 3.5" - 1.44Meg Drive fitted
- 40Meg 28MS Hard Disc Drive fitted
- HDD/FDD Controller Card
- 102 Key Keyboard
- Case with Keylock
- Eight expansion slots
- Two Serial and Parallel Ports
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- MS-DOS 3.3 & GW BASIC
- 12 months On-Site maintenance
- FREE £300 worth of Software/Hardware

Special prices:

- System 1 - As above plus a 14" High Resolution Flat Screen monitor £1299
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Watford's Brother Fax-150 puts the power and convenience of fax within the reach of everyone who needs to send correspondence quickly and reliably.

More small businesses are turning to FAX to speed and improve communications, and businesses who have been using FAX are now buying backup and "executive" systems for contingencies, and those more delicate items that need to be kept confidential.

The Brother Fax-150 is the answer to all these requirements, featuring a full function telephone/fax with optional password security.

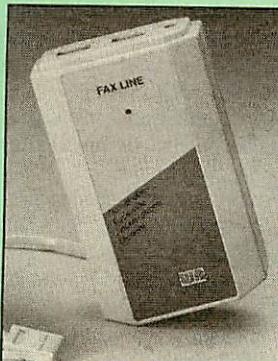
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- Group 3 compatible
- Photocopier facility
- Built-in Slimline telephone
- Password Security feature
- Pulse or tone dialling
- Redial/on-hook dialling
- Speaker and handset volume control
- 20 push button memory numbers
- Time and date generation
- Switchable auto/manual
- Contrast adjustment ledgers
- 16 shades greyscale
- Sender and receiver ID etc.

Sale Offer Only £429

Spare Fax Paper Roll £4
(Please write in for technical specification)



Watford Fax-Line Fax Splitter



The Watford Fax-Line fax Splitter doubles the utility of any phone line by automatically detecting and routing incoming fax to the fax machine, otherwise it routes the call to the telephone after a very brief message. Calls can even be directed to an answering machine. Standard BT connections provide simple plug-in-and-go operation. Fax-Line saves you hundreds of pounds in BT rental. **BABT approved.**

Launch Price: Only £69

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**£20 POINTER POINT**

Our starter this month is a little Risc OS application that demonstrates the finer points of the pointer.

It comes from Joe Abley of Bedford school who duly gets £20 for his coding efforts.

We've covered the subject of the pointer and how to change its shape in this column before. Because it is often useful to use a pointer of your own design within your own desktop window, there is an established way in which to do this and a 'legal' Risc OS call to do the work.

Joe's application consists of an empty window which can be dragged and scaled in the usual manner. Whenever the pointer moves over it, though, it changes into one of Joe's own design.

Incorporating the necessary code in your own application should be easy enough.

To try the demo, first create a directory called !PtrDemo. Then enter listing 1 from the yellow pages and save it in !PtrDemo as !RunImage.

Now run listing 2 – this creates the sprite and template files used by !RunImage.

Finally you will need to create an obey file called !Run and put this in !PtrDemo also. The most straightforward way to do this is by using !Edit.

The contents of !Run should be as follows:

```
Set ptrdemo$dir <Obey$Dir>
WimpSlot -min 32k -max 32k
IconSprites <Obey$Dir>
.Sprites
```

```
Run <ptrdemo$Dir>.!RunImage
```

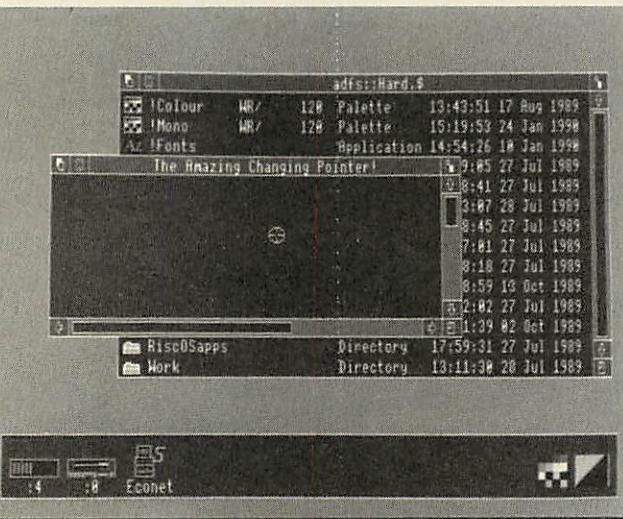
Now try the demo by double clicking on !PtrDemo. A window should appear.

When the pointer moves over it, a cross-hair should replace the standard arrow.

The old OS_Word and OS_Byt calls that used to be the means of redefining the pointer shape have been superseded by Wimp_SpriteOp with R0=36. (Wimp_SpriteOp is the Wimp version of the more familiar OS_SpriteOp call. It is used so that

For all Archimedes and A3000 owners, **DAVE ACTON** has compiled

RISC REVUE



An open window on to pointer redesign

the pointer to the Wimp's sprite area need not be specified.) This official call redefines the pointer according to a sprite definition and adjusts the scale and colour as necessary.

Pointer sprites have names in the form `ptr_xxxx` and the default pointer shape is called, unsurprisingly, `ptr_default`.

As you will recall if you tried the pointer editor from way back in the days of Arc Agora, there are four pointer shapes available to the user at any one time. Risc OS demands that when changing the pointer shape, you should do it to pointer 2 since pointer 1 is used by the Wimp for the standard arrow and 3 and 4 are used by the Hourglass module.

So that an application knows when the pointer is on its territory, there are two reason codes returned by `Wimp_Poll`: 4 (pointer leaving window) and 5 (pointer entering window).

So, to be legal, upon receipt of reason code 5 the application should issue the appropriate "Wimp_SpriteOp",36 call and after reason code 4 should restore the pointer. The *Programmer's Reference Manual* recommends a simple *POINTER command for this purpose.

Joe's program should be easy enough to follow. At the start, the Wimp is informed of the new task and the window is defined using template calls. The main loop contains a call to *POINTER and, as always, a CASE

statement is used to pick out the various events and requests as they occur.

`PROCdefault_pointer` resets the pointer shape to the standard arrow and `PROCmy_pointer` changes it to the cross-hair.

Note that the sprite `ptr_cross` has already been included in the common sprite pool by the *IconSprites command in the !Run file.

One awkward problem with changing the pointer comes when the screen mode is altered. After any mode change, the pointer is reset to the default shape, so applications should maintain a flag reflecting whether or not they 'own' the pointer.

If at the time of a mode change an application was 'in possession' it should redefine the shape as required.

The flag in the demonstration is called *IconSprites. The mode change is recognised by the application because a message &400C1 is received from `Wimp_Poll`.

£10 HIGH POWERED

Just a little something here for fans of large numbers. We had a set of mathematical items sent to us by A F Reysenbach of Amsterdam and listing 3 on the yellow pages is one of them.

It's a program to calculate powers of numbers – simply enter a number and the power to which it is to be raised. Memory permitting, the answer will be displayed in all its multi-precision glory.

Figure 1 shows an example of what the program can do – three raised to the thousandth power, the answer being a 478 digit number.

The program operates in a simple way using an array. Each digit in the answer is represented by an element of the array and a simple add-with-carry system is used in `PROCraise` to do the calculation.

Mr Reysenbach freely admits that he doesn't know why the small additional fraction in line 150 is needed!

The process, being in Basic,

takes a little while. On my old 440, it takes 9.23 seconds to calculate 3^{1000} . On an A3000 the pace will be noticeably brisker.

Out of interest I compiled the program with Silicon Vision's RiscBasic and the time went down to 2.29 seconds.

Similar speed gains were possible with Dabs Press's ABC.

£15 LIFE IN THE FAST LANE

I'm always a little cautious about carrying another version of the *Game of Life* in this column, despite the old chestnut's seemingly ageless qualities. However, this speedy little version from Andrew Smith of Kidderminster certainly deserves a look and earns him £15 too. You'll find it as listing 4 on the yellow pages.

Andrew's program is an Arc version of the speedy eight-bit *Life* by Phil Bender, carried in the May 1990 issue (page 73). The mouse is used to move the pointer around the display.

Use the left button (Select) to place a cell, the right button (Adjust) to remove a cell and press the middle button (Menu) to start the process of evolution. Press C to clear the grid and R for a random pattern (followed by RETURN when you're ready to start).

When evolving, press keys 1 to 3 to set the speed, P and O to pause and resume respectively, and Q to quit.

To try out the program, use Phil's original test pattern. Place a horizontal line of five cells on a blank grid. Move down a line

and put a cell under the left hand end. Move down another row and put one under the right hand end. Then click Menu.

After 1,200 generations the swirling cell patterns will settle into a stable state. This took 70 seconds in fast mode on the eight-bit version.

Andrew's Arm code adaptation takes a mere 20 seconds on a 310 machine.

One problem with such a fast implementation of *Life* is that the screen is only refreshed at 25 fields (or rather, 50 half-fields) a second. So, with an evolution rate of 60 or more generations per second, intermediate stages will inevitably be lost to the eye!

If you're feeling adventurous though, you might like to write a version of *Life* with the largest grid possible that still permits an evolution speed of 25 generations per second.

£5 ERROR UPDATE

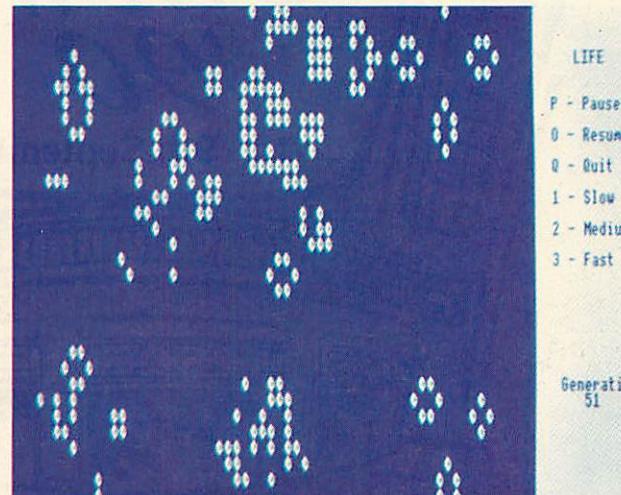
Well, we did have some problems with the Beeb-to-Arc screen converter by Gordon Jefferyes, carried in the July issue.

In his 10-line program we managed to insert five errors! Many apologies to Gordon and all. A corrected version is given on the yellow pages as listing 5. Remember to alter lines 10 and 30 as necessary.

Another goof you may have spotted was the IDs in the piece 'Back to Basics'. This should have been MIDS and was not a keyword from some new

```
1322070819480806636890455259752144365965
4220327521481676649203682268285973467048
9954077831385060806196390977769687258235
59509545821006189118653427257953674027
6202251983208038780147742289648412743904
0011758861804112894781562309443806156617
305408657449050617812548034405547054397
0388958174653682549161362208302685637785
8229022841639830788789691855640408489893
7609373242171846359938695516765018940588
1090604260896714388641028143503856487471
65832010614366132173102768902855220001
```

Three to the thousandth – as much precision as you'll need



Life, Jim, and much as we know it...

psychological programming language.

Philip Draper of Elstree has noticed some problems with the screen saver we carried in the April issue.

Apparently some problems may occur if a multi-sync screen is blanked for anything more than a few seconds.

If anyone has a cure, for this, or a screen saver that works in a different manner, why not send it in to us?

Michael Ellis of Kingston upon Thames has suggested an improvement for the *!Scrunge* utility that we carried in the March issue.

As you may remember, scrunged files are all of type DATA. Michael suggests using an 'unused' filetype for scrunged files.

I should point out that official permission should be sought from Acorn when using particular filetype numbers. If not, there will inevitably be clashes of interest in the future.

However, if you'd like to try Michael's alteration in the meantime, here's what you do:

- Insert the following line into the *!Run* file (after *SET Scrunge\$Dir):

```
Set File$Type_B00 Scrunge
```

- Create a new icon in *!Sprites* called file_b00 using *!Paint*. This should be the same size as other filetype icons.
- Add/modify the following

lines in *!RunImage*:

```
1725 OSCLI ("SETTYPE
"+scrungefile$+" Scrunge")
3650 PROCsetsaveicon
("file_b00")
```

- Finally, change the filetype of existing scrunged files using *SETTYPE.

I have also a report of a problem with *!Scrunge* (which I am currently investigating) and a couple of suggestions for improvements. Watch this space for future updates.

SEND THEM IN...

Submit your programs, ideas, hints and tips to: Risc Revue, BBC Acorn User, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.

If the limitless fame and prestige weren't enough, you could even earn yourself a quid or two, so get coding – why not?

BAU STYLE

Just a quick word on a couple of points of style.

We prefer, wherever possible, for Basic variables to be in lower case. This makes for tidier listings and is consistent with the rest of the magazine.

Also, Assembler listings should contain few (if any) comments.

We prefer to describe how the program works in the text and for labels to be descriptive.



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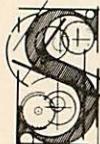
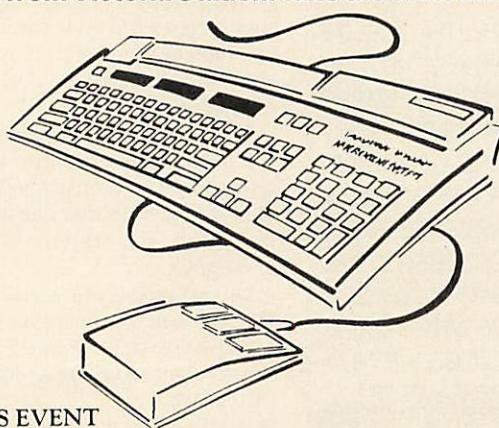
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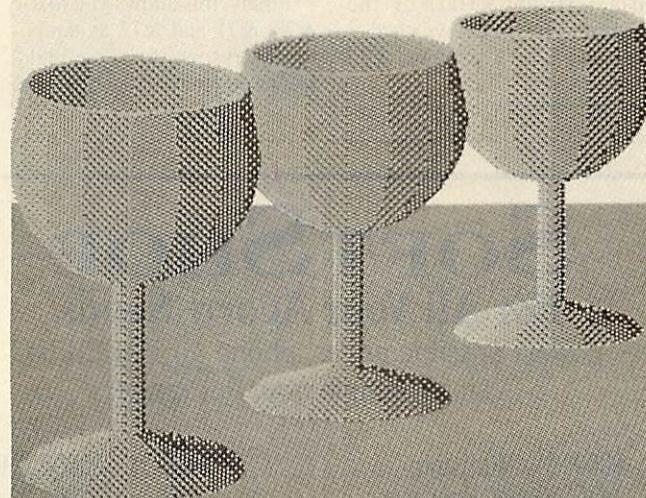
Malcolm Dolman of Holywell has read with interest Rob Miller's article 'Quick Turn-around' in the May 1990 issue of *BAU*, and feels the results on eight-bit machines could be improved on. Malcolm has provided two goblet-drawing programs based on Rob Miller's original algorithm. The first one draws a single goblet in mode 0 and works on the standard BBC. The second uses the extended colour fill routines (VDU 23,2,n1..n8) of the Master 128 operating system to maximum effect, and as such will only work on the Master and Compact (and of course the Arc!).

The first program is similar to Rob Miller's original except that it uses colour fill patterns, and works in mode 0 for maximum resolution. It would also run tolerably well in mode 4. The second program draws three goblets in mode 1 using Master extended colour fills. This time they are a bit more complex, as the ECF system is slightly strange in multi-colour modes.

£5 E ATTRIBUTE TIP

Here is an excellent tip, especially for teachers, from David Arnold at Warleigh School in Avon. When you use ADFS on the Master, you may find that you accidentally give the E attribute to a file, for example if you meant to type *ACCESS WR

EIGHT BITS

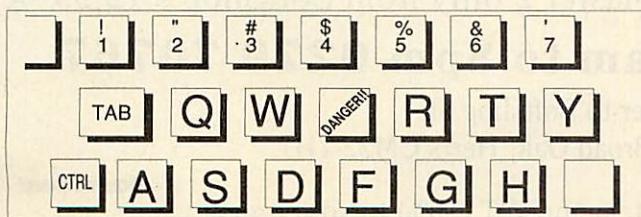


but hit the key next door! As you will know if you have ever done this, you can't 'undo' an E attribute. Once the E attribute is set, you cannot LOAD, CHAIN, TYPE or do anything except *RUN the file, and alarm and despondency can easily set in. You can remove the attribute with a special file, but what if this is not to hand?

If you have an Archimedes

you can easily solve the problem. The Arc will read the Master's ADFS discs but does not use the E attribute at all. Pop the disc into the Archimedes, and type *ACCESS <filename> WR and then return the disc to the Master. The file will now be readable and writeable to.

I have often wondered why Acorn used this system. Any files set to E can only be *RUN, so combined with an *FX200,3 command at the start of the program (which causes all memory to be wiped on BREAK) it is possible to make a program secure against copying. However, discs with E attributes work correctly with *BACKUP thus defeating any copy protec-



tion ideas. In any case, anyone who can disassemble a machine code program probably also has the wit to get the bytes of the file directly off the disc using a sector editor.

£10 RAMLESS PROGRAMS

Simon Young of Fareham was reading through the yellow pages of June's *BAU* and noticed a slight problem with the *Dropkick* utility written by Jeff Tullin, in that it attempts to preserve all zero page workspace, but nevertheless fails to preserve address &70.

As he has had the same problem with his own programming, he has written with a solution, which shows you how, by careful use of the stack, to avoid corrupting any zero page Ram with your sideways Rom handling software.

This is a major problem for writers of service Roms, and although I have seen the solution used by professional programmers, I have never seen it in any book or article.

Often when writing utilities to operate from sideways Rom (or Ram) it is undesirable to reduce program workspace by claiming pages of memory for use by the Rom. Invariably, however, the Rom will have to use some Ram as workspace.

In such cases programmers usually make use of the section of zero page reserved by Basic for the user (ie &70-&8F).

Although it is unusual for languages and wordprocessors to use this section of memory for anything other than temporary workspace, programmers often make extensive use of zero page. It is vital that the Rom utility restores the values which it overwrites so that it will be compatible with user programs (which may call the SWR utility) and languages alike.

Dropkick highlights the real problem quite nicely. If you examine the program you will note that although an attempt is made to restore the zero page workspace used, &70 remains overwritten with the value of

the accumulator (the service type requested) on entry to the Rom. If a program calling this routine was using &70 things might not work out as intended.

So the real problem is the need to preserve zero page workspace and at the same time both preserve and make use of the vital information stored in the accumulator, X and Y registers on entry to the Rom.

You cannot use the workspace because you need first to preserve it and you cannot preserve the workspace without overwriting the accumulator.

The answer to your problem is to make use of the stack. On the BBC and the Master alike, the stack occupies page one (&100-&1FF).

In fact, it is more true to say that the stack occupies &1FF-&100 as the stack works backwards from &1FF with the low byte of the next available stack

address being stored in the stack pointer. Hence when you push a value onto the stack it is stored at &100 plus the value of the stack pointer and the stack pointer is then decremented.

And when you pull a value off the stack the stack pointer is first incremented and then the value stored in the address &100 plus the value of the stack pointer is read.

This said, it becomes easy to push values onto the stack and make use of them later by reading them directly rather than pulling them off the stack.

Say you want to preserve all of the user zero page space (&70-&8F) and write the entry values of the A, X and Y registers to &70, &71 and &72 respectively, and write the stack offset (from &100) of the pushed values of the A, X and Y registers to &73, &74 and &75 respectively.

This can be done with:

```
PHA  
TXA  
PHA  
TYA  
PHA  
TSX  
INX  
LDY #&8F  
.store LDA &0000,Y  
PHA  
DEY  
CPY #&6F  
BNE store  
LDY #&02  
.write STX &73,Y  
LDA &0100,X  
STA &70,Y  
INX  
DEY  
BPL write  
LDA &70  
LDX &71  
LDY &72
```



```
.returnreg LDX &73,Y  
LDA &70,Y  
STA &0100,X  
BPL returnreg  
LDY #&70  
.restore PLA  
STA &0000,Y  
INY  
CPY #&90  
BNE restore  
PLA  
TAY  
PLA  
TAX  
PLA  
RTS
```

The reasons for also making a note of the stack location of the A, X and Y register stores are twofold.

Firstly, this allows you to use &70, &71 and &72 as temporary workspace for these registers as you may at any time read

their original values and secondly, it allows you to write specific return values of these registers to their stack locations which would then be read in the return routine:

```
LDY #&02  
.returnreg LDX &73,Y  
LDA &70,Y  
STA &0100,X  
BPL returnreg  
LDY #&70  
.restore PLA  
STA &0000,Y  
INY  
CPY #&90  
BNE restore  
PLA  
TAY  
PLA  
TAX  
PLA  
RTS
```

The only possible snag which I can see with using this technique is that heavy use is made of the stack.

The reason this might be a problem is that some service paged Roms use &100 upwards to store error messages.

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This said, the chances of you overwriting these messages is almost nil.

Since we began with the *Dropkick* utility, this seems like a good place to end.

With the following amendments to the SWR listing 1 of June's *BAU*, the problems that were identified earlier are now overcome:

```

145 astac=&70
440 PHA
530 LDX #8
550 LDA &70, Y
599 TXA:PHA
600 TSX
601 STX astac
602 LDA #14
603 ADC astac
604 STA astac
605 LDX astac
606 LDA &0100, X
607 STA accum
608 PLA:TAX
609 LDA accum
685 LDX astac
686 LDA acccum
687 STA &0100, astac
720 STA &70, X
740 CPX #8
840 PLA

```

£5 PRINTER CLINIC

Mr V Morton from Leatherhead read my printer article in July, and has made some interesting points. Firstly, something I did not know, is that true A4 paper measures 250*20.25 millimetres along the long side, which is 297.30, not exactly 297 as is usually quoted. Mr Morton's main point however is that on all A4 continuous stationery that he has seen, there have always been 23 1/3 pin holes precisely. As the pinholes are spaced at half-inch intervals, and printer lines are normally one sixth of an inch apart, this makes the paper extend to exactly 70 lines with no cumulative error on printing. The paper is 11 2/3 inches long which is not exactly A4, as explained in my article.

Upon checking my own stock of A4 continuous paper, I find

it is indeed like this, but the original article was also based on comments received from many users over the years about A4 paper in dot matrix printers.

Mr Morton goes on to point out on behalf of his Citizen Swift 24 printer that it can do nine-pin graphics without elongation – all you need to do is to switch to IBM emulation. Although some of the Epson commands no longer work, all the important ones do, including colour changing when using the Swift's optional colour kit. This is, I expect, because the IBM mode is in fact emulating an IBM Proprinter, a nine-pin model, and it will be the 24-pin commands which do not work. This doesn't seem to affect the quality of the LQ print, which is still up to 24-pin standard when in this mode.

In nine-pin graphics the dots are uniformly spaced at 1/72 of

an inch. The closest a 24-pin printer can get is 1/60 of an inch, which is 20 per cent greater. But the Swift 24 is clever. On IBM emulation it uses alternate spacings of 2/180 and 3/180 of an inch, and this works out just right overall.

£5 DFS CATALOGUE PROTECTION

This is a fairly old subject, but has not been aired for a year or two in this magazine. I have had a fair amount of correspondence on the subject, and so it is worth going over it again.

Many readers would like to emulate the protection system placed on some commercial DFS discs which prevents you from looking at the catalogue of the disc, so that the *CAT command doesn't work.

Mark Lomas from Warrington has sent in a pair of programs, one of which protects or

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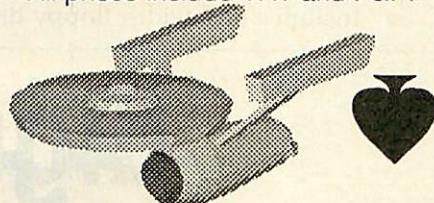
Such is the enthusiasm for **Euclid** there is now a user group called **Elements** which provides a quarterly disk containing hints, tips, animations and user pictures like the ones in this advertisement.

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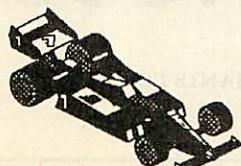
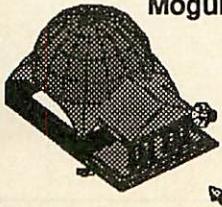
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unprotects the catalogue, the other allows you to view the catalogue of a protected disc.

Catalogue protection works by placing a Ascii code 21 in the title string. Ascii 21 is a

control code which disables VDU output, and therefore if this code is inserted in the title string, then all VDU output after the title will be inhibited. As the first thing printed when you type *CAT is the title of the disc, then effectively nothing is displayed except those characters in the title which precede the code 21.

Note that this method does not re-enable the VDU after *CAT has finished. It is possible to do this, but fairly difficult as it involves embedding an 'enable VDU' code (Ascii 6) as the last character of the last filename on the disc. However, if you try to catalogue a disc the computer appears to lock up, because nothing you type, including ESCAPE seems to have any effect. You can recover normal output by typing CTRL-F on the keyboard, which is of course equivalent to typing VDU6.

The first of Mark's programs

(both of which can be found in the yellow pages) is a Basic program, and should be typed in, saved and then CHAINED. A menu is offered at which you type '1' to protect a disc and '2' to unprotect it.

You are then asked which drive contains the disc you wish to protect. In normal DFS fashion, this can be 0, 1, 2 or 3, as DFS treats each side of a disc as a separate drive.

If you wish to protect a disc which is in the same drive as that from which you loaded the program, be sure to remove the program disc first and insert the correct disc before you select the drive.

The program loads in the first sector of track 0 of the disc, where the catalogue is contained. The first eight characters of the disc title is stored in the first eight bytes of this sector. The rest of the title is stored

in the first four bytes of the second sector, but to achieve this effect you only need to look at the first sector.

To protect the disc, the first eight bytes are filled with the Ascii codes for the string 'Secret!' followed by code 21, which is exactly eight bytes. Nothing else in the sector is altered and the whole sector is then written back to disc.

To unprotect the sector, all that is necessary is to remove the code 21. The program removes the message as well by setting all the first eight bytes to zero, effectively removing the first eight bytes of the title.

Note that if the original title prior to protection was longer than eight characters, then only the remaining characters will reappear.

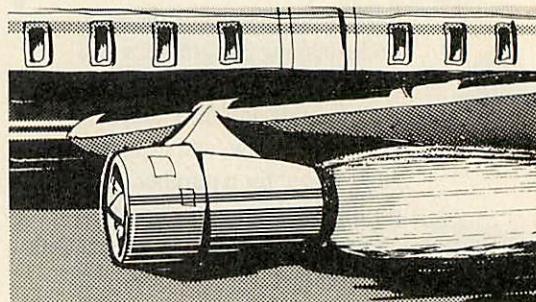
The program uses the usual OSWORD &7F routine to read in the catalogue sector, and the

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same call to write the sector back after alteration.

Note that if you have a disc sector editor such as that contained in the Watford DFS, *Disc Doctor* or *Advanced Disc Toolkit*, then you can effect and remove this protection without resort to this program. All these sector editors, if started up without parameters, automatically load in the first sector of the first track, which is the sector you want to alter.

To protect the disc, enter the word you wish to appear before VDU output disappears into the first bytes (starting from byte 0, at the top left of the sector display) and then after the last character of the word enter the value 21.

Most sector editors allow you to enter data in either hex or Ascii format, normally toggled with the TAB key. The text of the title to be displayed should

be entered in Ascii mode, and the code 21 in hex mode – 15. To unprotect a protected disc, change all of the first eight bytes in sector to zero (or you could just change the byte containing 21 to a printable character).

To effect the change, just save the altered sector back to disc. Be careful not to change any other bytes in the sector or you may find that the filenames have been changed.

The second program Mark provides is a machine code program which should be typed in from the yellow pages or loaded from the monthly disc, and then run. Running it creates a machine code program called PASSCAT.

If you run this program, by typing *PASSCAT, it prompts you for the drive number in which the protected disc is contained. If you only have a single drive, you might swap discs at this

point. After you have keyed the drive number (there is no need to press RETURN) the relevant drive will be catalogued in the normal way, whether or not it is protected.

This routine will also catalogue discs which have been catalogue protected by other methods, including those which have Ascii 21 in filenames as well as in the disc title.

It works by redirecting screen output (the OSWRCH call) to a routine .print which checks whether the character being sent to the VDU drivers is 21, and if so replaces it with 42, the code for an asterisk. Any 'disable VDU' codes can be identified on screen as asterisks.

The routine then issues the normal CAT command through the OSCLI routine, the command being appended with the drive number you typed at the prompt. Finally the routine 'unhooks'

the redirection of OSWRCH and restores the normal vector. The protected catalogue system does deter the casual user from prying into how you have set your disc up. However it is not foolproof – for example the *INFO ** command will display the names of all the files on a protected disc.

If you have any hints or tips for the eight-bit range of Acorn machines, we would be pleased to hear from you. Submissions may or may not include a program, but should run to between 300 and 1500 words of documentation. Particularly welcome are tips which increase productivity, such as enhancements for popular programs, or explanations of difficult topics, rather than just programming demonstrations. Send your ideas to David Atherton, Eight Bits, BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ.

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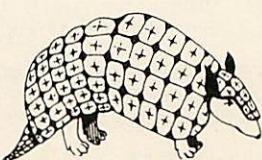
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Last year's feature on Beeb and Arc ray tracing met with a very enthusiastic response from readers. So by popular demand, **RICHARD BROWNING** delivers a second dose of arcane and learned optical lore

RAY'S OF SEEING

Do you remember the ad for Access which had cute little duckies floating around a credit card? (No, I didn't get the connection either). That was 'ray tracing', a way of generating the most realistic images obtainable using a computer graphics system.

It involves tracking rays of light through a predefined scene (see figure 1) in which all the objects – spheres, walls and so on – have their own characteristics, for example a reflective tabletop or a matt squash ball.

Ray tracing can't simulate everything in nature – yet. Limitations exist, not least the speed at which an image is rendered. Real-time ray tracing remains a dream, but with the introduction of ever-faster processors, who knows what might happen?

I wouldn't want to give an average rendering time for the program accompanying this article, but the realistic minimum is about one hour for the Arc and several hours for the Beeb.

Plane speaking

An infinite number of objects can exist in any scene, each having its own physical characteristics and visual parameters. But computers have only finite resources, especially the Beeb. So, for this implementation, I'll introduce only the two most common objects – spheres and planes.

The first thing we must do is decide how to represent a ray in the computer. This ray is the one we trace emanating from the viewer's eye, back through the pixel on the VDU and hence into the scene. We need to know which objects the ray hits and where it intersects those objects.

The ray is traced back from the eye through the pixel. If it were the other way (ray through pixel to eye), an infinite number of different rays could pass through that pixel into the eye.

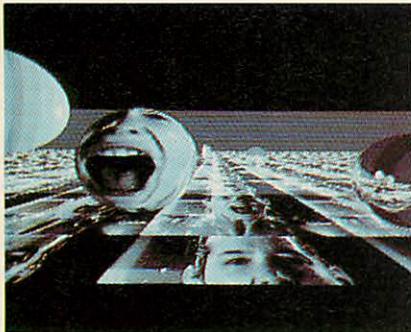
A ray has three components, all defining its direction of movement through 3D space in terms of x, y and z movements (horizontal, vertical and depth). We call the ray a 'vector' and, to find its absolute position in space, its starting point is also required.

The ray, therefore, has both a direction and an origin defined thus:

$$\text{Rorigin} = \text{Ro} = [x_o \ y_o \ z_o]$$

$$\text{Rdirection} = \text{Rd} = [x_d \ y_d \ z_d]$$

Most vectors used in ray tracing are 'normalised' which means that the x, y and z



direction components are altered so that the sum of their squares equals 1:

$$x_d^2 + y_d^2 + z_d^2 = 1$$

Arbitrary units

To represent mathematically a line which has been defined by a vector, then the vector's origin (R_o), its direction (R_d) and some factor (we call it t) determining the length of the line or the position of the final point of the line are needed:

$$R(t) = R_o + R_d * t$$

Variable t can take any value – obviously the greater it is, the longer the line.

At last, we can mathematically define a ray (and line) in 3D space. But there's not much point in having a ray if there's nothing to connect it with.

Somehow, you have to determine if and where a ray strikes an object. This means you need to know how to represent an object mathematically.

Let's deal with spheres first. There are two ways of testing to determine ray-sphere intersections. The first uses algebra and the second geometry. I've chosen the latter as I used algebra in my last ray tracing article, and geometry also happens to be quicker.

Remembering the aim of all intersection methods is to give the value of t so that coordinates can be calculated for the intersection point, look at figure 1. Try and identify the ray, the radius of the sphere and look at the brief notes accompanying the diagram.

Don't worry if you don't understand. The theory does work, believe me! (There's a list of reference material at the end). All spheres have a centre and a radius and using these parameters a solution for the sphere can finally be achieved:

$$t = t_{ca} \pm \sqrt{t_{ca}^2 - R^2}$$

BEEB AND ARC DIFFERENCES

Beeb owners will have to save the PROCgetcoeffs from the Arc version as a separate file. As downloading occurs, the scene data will need to be compiled prior to downloading so that it can be saved.

I have defined a mono palette in mode 2 on the Beeb – so turn the colour down.

Beeb owners can't enjoy the sprite mapping facilities of the Arc, so must insert a mathematical function in FNgettext (Arc owners can do this as well if they want).

(plus or minus depending on whether the ray begins inside or outside the sphere).

The advantage of this geometrical solution is that checks can be made during the computation which may cause the routine to report that the ray missed the object.

The next object we have to check for is the plane (figure 2). The only sensible way to work this one out is to use algebra. A plane can be defined as a vector with four components – all those of a ray, but another one which also determines the 'parallel movement' of the line, to make the plane. The components are neatly parcelled up so:

$$\text{Plane} = [A \ B \ C \ D]$$

Through dint of mathematical application and copious study, I can reveal that this vector is really the same thing as:

$$(\text{Plane} \equiv) A*x + B*y + C*z + D = 0$$

This is, oddly, called the plane equation.

How does one find the solution to this with regard to an intersection with a ray?

Well, remember that any point of a ray can be shown by the parametric equation:

$$R(t) = R_o + R_d*t$$

This is called parametric because the equation gives a different result for every value of t . If the ray is at position $x \ y \ z$, you can then take the associations:

$$x = x_o + x_d*t, \ y = y_o + y_d*t,$$

$$z = z_o + z_d*t$$

We then substitute these associations into the original plane equation and rearrange it all so we get t on one side of the equals sign, by itself. Again, for detailed explanations, get one of the books listed at the end.

The distorted truth

Assume that we now have the intersection point in 3D space of the ray and the object. What about the object itself? It can be reflective, transparent, dull or whatever.

We'll deal with some of these possibilities later, but for right now just consider that it may be necessary to apply some sort of pattern to the surface of the object. For example, a plane may actually be a painting so we need to map the plane onto a sprite which itself holds the 2D representation of the painting. Or we may wish to render a globe complete with surface map, stored as a sprite.

Alternatively, instead of a sprite a mathematical function can be used which describes the intensity of every point on the map. These processes of mapping a 2D object onto a 3D one (or 2D-2D, 3D-2D) are generically termed texture mapping.

A texture mapping procedure needs several things: the type of 3D object it's mapping onto and any relevant dimensions (such as the vertices of a polygon or the radius of a sphere), the intersection point and also the 2D object it's taking the map from (for example, a sprite or mathematical function).

Mapping a sphere is, conceptually at least, a simple task. We basically want to

SETTING THE SCENE

The scene is described as a series of DATA statements after the program, each describing an object. Be warned: complex objects mean long DATA statements. The DATA format for one object is:

```
DATA Obj_type, Pos_Args, Intensity,
Surface,
[Ind_refrac/Vertex_list]
```

Taking each parameter in turn:

- Obj_type is 1 for spheres or 2 for planes.
- Pos_args is actually a series of parameters which define the bounds of the object. For a circle, these are the x, y and z co-ordinates of the centre followed by the radius. For a plane, these are the A, B, C and D arguments (see below).
- Intensity is the initial intensity of the object, which is a value from zero to 15.
- Surface Individual bits can be set within this parameter to give the nature of the surface. For a simple surface, the relevant values are:

- 1 Matt
- 2 Shiny
- 4 Mirrored
- 8 Opaque (refract)
- 16 Texture-mapped
- 32 Quadrilateral-mapped

For a complex surface, these values can be added together to give any combination of qualities. For example, a shiny mirrored surface has a value of $2 + 4 = 6$. Note that only planes can be quadrilateral-mapped, and if they are texture-mapped, they must in addition be quad-mapped too.

The last parameter is optional and represents either Ind_refrac, the refractive index, which applies only to spheres, or Vertex_list, a list of vertex co-ordinates on which the plane equation can be based (see Examples).

The A B C D parameters for the plane data arguments are obtained for any given plane as follows:

- List the four vertices for the polygon.
- Call PROCgetcoeffs whose parameters are the four 3D co-ordinates.
- PRINT A,B,C,D.

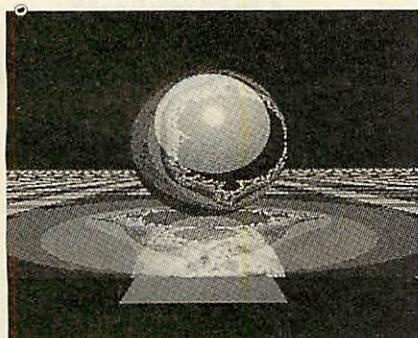
Here's an example:

```
>PROCgetcoeffs(2800, -200, 2000, 2400,
-200, 0, 3400, -200, 0, 3200, -200, 2000)
```

You may find that the numbers returned are quite huge. In this case, try and find a common denominator. For example, if A, B, C, and D are 0, 30000, 0 and 90000 respectively, simplify to:

0 1 0 3 !!!

If you specify a texture-map for a plane, you must also specify quadrilateral-map (ie 32 + 16 = 48) and supply the four ordinates after the SURFACE parameter in the DATA list. For spheres, the index of refraction must be specified after the SURFACE parameter.



unwrap the sphere into a rectangle, and then to map the intersection point onto this rectangle. The technical term for this process is spherical inverse mapping.

In figure 5, you'll see that we need a vector pointing from the sphere's centre to its north pole, and another vector pointing from the centre to a reference point on the equator. The latitudinal and longitudinal parameters of the intersection point are calculated using these vectors and mapped onto the rectangle to find the resulting point.

To make life simpler, both parameters take values between 0 and 1 along the u (horizontal) and v (vertical) axes of the map rectangle. This means that an Arc screen of 640 X 256 pixels is converted to 1 by 1 unit, which also makes function mapping easier as well (especially where trigonometric functions like sin, cos and

tan are used). Plane mapping is rather more involved. Firstly, note that the plane equation given above has no limits, meaning that the plane the equation describes has an infinite extent. For a mapping process, we clearly desire some reference points.

For mapping onto a rectangle, it seems sensible to use four points (or vertices) on the plane which describes a polygon, within which you can apply texture mapping (we can also use the polygon to limit a plane anyway, whether or not we wish to apply texture mapping).

The technical name for all this is 'convex quadrilateral inverse mapping'. If you look at figure 6 you'll see a diagram of a distorted quadrilateral. Given an intersection point R_i , we need to map this point onto the sprite or function unit rectangle (by unit, I mean with extent of 0..1 by 0..1 as for the sphere rectangle map).

As the book says, the method for polygon mapping involves deriving a function which describes the polygon's perpendicular plane axes from the co-ordinate system origin (meaning [0 0 0]).

This supplies us with an equation which is plane-dependent. This in turn is used to map R_i onto (u, v) . The method can be speeded in certain areas, for example checking to see if the axes are parallel or if any of the square roots would give imaginary results (No, the computer doesn't dream! An imaginary number is the square root of a negative number. The theory behind imaginary numbers is used in the generation of fractals and the Mandelbrot and Julia sets).

On reflection

Now you know how to represent a ray and how to calculate if it intersects with an object, and also if that object has any form of map associated with it.

But the object could be reflective. And the components of reflection could be specular, diffuse or ambient. A light shining on an apple gives highlights. This is specular reflection. The dull glow from a squash ball is diffuse reflection. But don't forget, though, 'proper' reflective surfaces, like mirrors. Ambient reflection is not really reflection, it's just the normal (unaffected) intensity of the environment.

Specular reflection is one of the hardest components to model in ray tracing, so I'll stick to what is called 'perfect specular reflection'. This component is the part of the incident ray from the light source which is reflected from the outer surface of the object, in a direction whose value is entirely dependent on the angle of the incoming light ray. This also means that, if white light is shone onto a blue shiny object, the highlights are white and not blue.

So, specular reflectance is directional, dependent on the value of the incident light – light reflects only if the angles of inci-

EXAMPLES

(Note that instead of ORing SURFACE types, you can add them to get the final type)

Infinite mirrored plane at $y=200$:

DATA 2, 0, 1, 0, -200, 0, 4

Shiny sphere at (300,400,200), radius 200:

DATA 1, 300, 400, 200, 200, 3, 2

Shiny sphere at (300,400,200), radius 200 and also texture-mapped:

DATA 1, 300, 400, 200, 200, 3, 18 (2 + 16 = 18)

Opaque sphere at 0,0,0, radius 90 and refractive index 1.33:

DATA 1, 0, 0, 0, 90, 0, 8, 1.33 (RI specified after SURFACE parameter)

For a more complex example try this texture-mapped plane with mirrored surface and vertices as given in the example above:

DATA 2 (plane)

DATA 0, 1, 0, 200 (A, B, C and D)

DATA 0 (Intensity added to texture map)

DATA 52 (mirrored = 4 texture-map = 16)

(You also need quad-map = 32 which gives 52 when added together)

DATA 2800, -200, 2000, 2400, -200, 0, 3400, -200, 0, 3200, -200, 2000 (the 4 vertices)

dence and reflection are equal (see figure 3).

Note that there's a coefficient associated with the specular reflection calculation (ks). This determines the 'spread' of the highlight – such a small parameter can have dramatic results on an image.

Diffuse reflection, on the other hand, is not reflection in a determined direction; instead it is light which is scattered equally in all directions so that the surface appears to have the same brightness when viewed from all angles. This is unlike specular reflection, which seems to follow you if you change your viewing angle (see figure 4).

A very important mathematical function in ray tracing is the dot product, used in almost every rendering methodology. This function, whose parameters are two vectors, returns the angle between those vectors. The function is used directly in the computation of diffuse reflection, whose value is multiplied by some illumination constant to provide the final intensity value of the point.

Ambient light is simply a constant illumination on all objects, regardless of their orientation. Images rendered using just ambient light are boring and unrealistic, but an ambient component in the total 'illu-

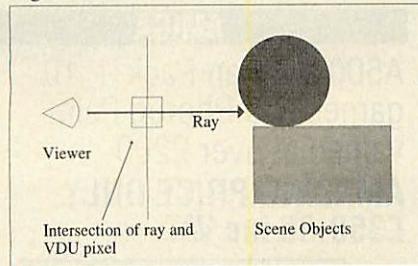
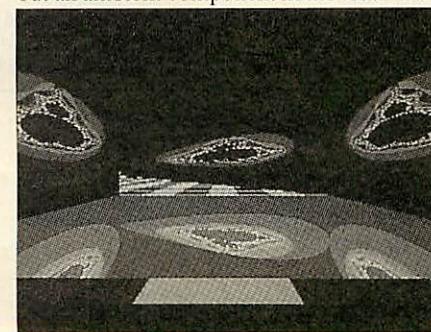


Fig 1. Tracking light rays

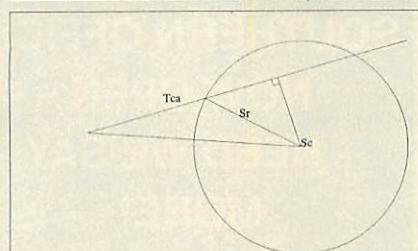


Fig 2. Calculating ray-sphere intersections

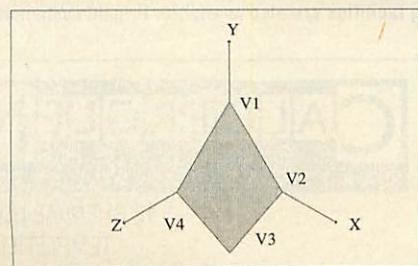


Fig 3. The vector components of a plane

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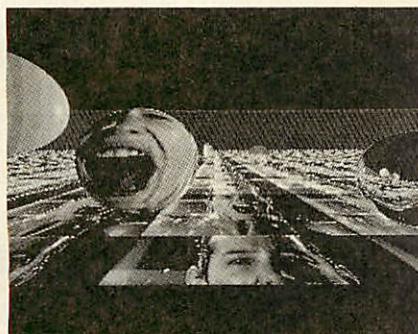
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mination equation' is almost always required. It forces objects to be visible.

The same method for calculating the reflection vectors in specular reflection is used for bouncing rays off reflective surfaces like mirrors. The derivation is quite involved, but relies on the fact that the angle of reflection from a surface is the same as the angle of incidence (figure 5).

Next on the list is refraction. An example of refraction is a stick in water which seems to bend at the point of contact.

The angle at which the image, or ray, is bent is entirely dependent upon the 'refractive indices' of the two adjacent media. The refractive index of air, for example, is pretty close to 1 and, for water, it is about 1.33 (both figures are ratios with respect to a vacuum). Normally, the index of one medium is divided by the index of the other, giving a fixed relationship. This value determines the angle at which the ray bends by a rule known as Snell's Law.

The refracted ray can be derived either by an algebraic approach or by the geometric route. I've chosen algebra.

The final formula for the refracted ray and a diagram are given in figure 4.

Basic geometry

A surface can be defined which is quite capable of both refraction and reflection, like water. When this happens, the ray splits into two: one following the refracted path and the other following the reflected path. Either of these rays may then continue this process, continually dividing if necessary, until a termination condition is reached, such as the ray leaving the scene.

Picture this as the first ray (the one leaving the eye of the viewer) as the root of a tree, which when confronted by both refraction and reflection causes the tree to branch. Each branch then follows the fate of both rays. Further branching may occur.

Such a structure obviously indicates the need for a recursive algorithm. Briefly, a recursive program is a program which can call itself. So that the recursion may be stopped at any level, it is necessary to have a terminating condition (ray leaving scene).

The program given in the yellow pages (page 84) is a fairly complex renderer, capable of displaying any number (memory

limited) of planes and spheres. The objects can be texture-mapped (and in the case of planes, polygon-mapped), have surface characteristics of diffuse and specular reflection, refraction, and mirroring. Real (not integer) variables are used, so a wide space is available for the placement of objects.

The ground, an infinite plane placed at $y = -500$, is the infamous tartan.

There are several constraints: only one light source has been defined, refraction is restrained to spheres only and spheres with refraction characteristics mustn't intersect with any other object (lack of memory), even though if such an intersection does occur the program won't crash, only produce odd results; the position of the viewer is defined in the variables px , py and pz (in the Arc version) and it's only possible to look in the z direction.

The 'focal length' of the 'camera' is defined by the distance of the viewer from the screen plane, defined by the variable $Screen_z$. The larger this is, the greater the zoom.

The specular reflection coefficient is global to all objects, although the refractive indices are local to the spheres.

You can get a lot of fun from ray tracing. The screenshots give an idea of what can be achieved – the possibilities are endless.

References

Fundamentals of Interactive Computer Graphics, J.D. Foley, A. Van Dam, Addison Wesley, ISBN 0-201-14468-9, pp664. Takes the reader from the very basic input stuff through to Bezier curves and more.

An Introduction to Ray-Tracing, edited by Andrew S Glassner, Academic Press, ISBN 0-12-286160-4, pp327. The best book for those who know computer graphics and wish to branch into ray tracing.

PROCEDURES AND FUNCTIONS

FNfloor	Returns an intensity, dependent on where the ray lands.
FNtrace	The main routine. Checks for ray intersections, calculates intensities and if necessary recurses for new ray branches.
FNhit_sphere	Called by FNsphere , this returns TRUE or FALSE depending on whether the ray intersected the sphere.
FNsphere	Obtains parameters to define sphere, calls intersection routine and if necessary sets variables defining the hit location.
FNplane	As FNsphere , but for planes
FNhit_plane	ditto
PROCgetcoeffs	Translates scene data
FNdifff	Returns the intensity of a point subject to diffuse radiation.
FNspec	Returns the intensity of a point subject to specular radiation.
FNmirror	Calculates reflection vector of incident ray and calls FNtrace .
FNopaque	Ditto, but for refraction vector.
FNmap	Calls a mapping routine, depending if the object is a sphere or plane.
FNsmap	The sphere mapping routine. Returns intensity.
FNpmap	Polygon mapping routine.
PROCxprod	Another function vital to ray tracing, the cross product.
FNDot	As discussed above.
PROCrefl	Calculates reflection vectors.
PROCnormalise	Normalises vectors.
FNgtext	The routine which gets the intensity from the rectangle texture map.
PROCsetpalette	Sets the palette for a grey scale.

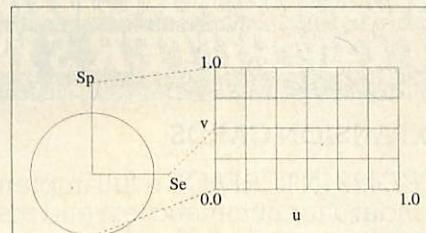


Fig 4. Spherical inverse mapping

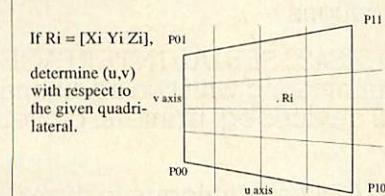


Fig 5. Quadrilateral inverse mapping

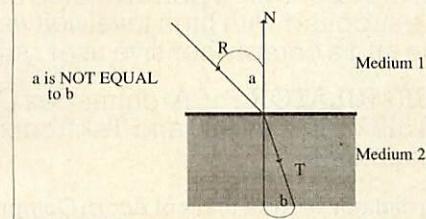


Fig 6. Refraction at a media boundary

Procedural Elements for Computer Graphics, David F Rogers, McGraw-Hill International Editions, ISBN 0-07-Y66503-6, pp433. Excellent tome, recently out as a second revised edition.

Fundamentals of Three-Dimensional Computer Graphics, Alan Watt, Addison-Wesley, ISBN 0-201-15442-0, pp430. A how-to, rather than a why-to, book.

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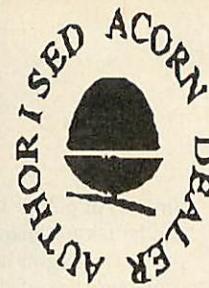
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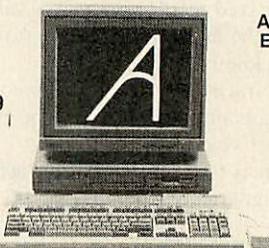
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STRETCHING A POINT

Quite recently I was fiddling around with *!Draw* trying to draw some simple 3D scenes. All I wanted was a couple of perspective cubes with pictures drawn with *!Draw* on their sides. Unfortunately, despite all the various functions provided by *!Draw*, there is no general 'distort' option – for example, given a rectangle, this would provide the ability to stretch its corners individually into an arbitrary quadrilateral. So, armed with nothing more than some very early Acorn documentation on Draw files and the Draw module (an integral part of Risc OS), I set about writing a utility, *!Stretch*, to do exactly this.

Doing a stretch

!Stretch is a standard Risc OS application. Once installed on the icon bar (by double clicking the *!Stretch* icon), Draw files can be dragged onto it either from the filer or directly from *!Draw*. Click on the *!Stretch* icon and a blank *Stretch* window will appear on the screen. Any files dragged or 'saved' onto this window from *!Draw* will appear at the pointer position.

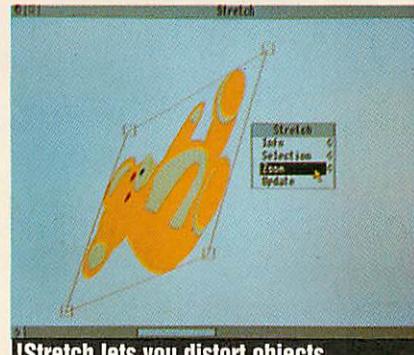


Up to eight objects may be present in the *!Stretch* window at a time, although only the currently selected one may be moved, stretched, saved or deleted. To select an object simply click on it with the Select button. The bounding box will then appear in red.

To move an object simply click on one of the corners of its bounding box with the Adjust button and, holding this button down, move the object to the desired place. To stretch one corner, click on it with Select and move it in the same way.

A menu is provided and this can be pulled up with the Menu button. If you have selected an object, the Selection sub-menu will be available. Click on Delete to remove that object or go to the Save option if required. You can save the object as a Draw

Some very powerful graphics routines are hidden inside the Arc. **CHRIS RUSEMAN** explains how to tame the Draw module and harness it to your advantage



!Stretch lets you distort objects

file or, more conveniently, drag the save icon onto *!Draw* itself.

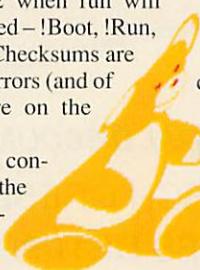
The Zoom option allows you to change the scale of the *!Stretch* window. Any scale from 1:8 up to 8:1 is allowed. Either click on the arrow buttons or enter the scaling factors directly at the caret.

The last option on the menu is Update. Clicking on this will switch the 'continuous update' facility on or off. If it's on then when dragging or stretching an object it will be redrawn whenever possible. If it's off, just the bounding box of the objects will be shown.

The listings

You'll find two listings on the yellow pages. Listing 1 is the main program and should be saved as *!RunImage* in a new directory called *!Stretch*. Listing 2 when run will create the other files required – *!Boot*, *!Run*, *!Sprites* and *!Templates*. Checksums are included to avoid typing errors (and of course, the programs are on the monthly disc too).

Much of *!RunImage* is concerned with the Desktop – the 'clever' stretching procedures are at the end of the listing. The application re-



quires the ColourTrans module (which you'll find on your application discs somewhere) in order to work. Make sure this is loaded, or is somewhere where it can be found (this means in practice saved as *!System.Modules.Colours*).

Any text or sprites in the file cannot be distorted and are therefore not displayed in the *!Stretch* window. When reloaded into *!Draw* these will appear in their original positions.

The Draw module

Draw files and the Draw module are complicated beasts and an article could be written just on the format and use of them alone. I'll just concentrate on the relevant parts of the module that I've used for the *!Stretch* program.

!Draw files contain an object by object description of a graphical image. Such images are made up of 'objects': paths (lines and curves), bit-mapped images (sprites) and text (both strings and blocks). As mentioned above, we are only interested in the paths, as sprites and text cannot easily be distorted (without dramatically increasing the program size). In addition any number of these objects can be collected together in a 'group'. It is also quite possible for groups to be nested. The structure of *!Draw* is therefore inherently recursive.

The Draw module (built into the Risc OS Rom) is in fact much more versatile than *!Draw* lets on.

It can deal with all sorts of lines and curves and provides many 'hidden' graphical functions apart from the obvious 'please-draw-this-funny-shape' request with which we're all familiar.

However, it does not deal with text and sprites, which therefore need to be handed to the OS and the Font Manager. (This is another reason *!Stretch*

doesn't stretch text and sprites!).

Buried within *!Stretch* is a procedure called *PROCdraw*. Its first parameter is the address of a block of memory containing a Draw file.

The procedure works its way through the file, isolating the paths and calling the Draw module to plot them on the screen.

This is one of the recursive pieces of code – *PROCOBJ* calls *PROCgroup* (to deal with grouped objects) which in turn calls *PROCOBJ*. Don't worry too much about this – just take it from me that it works!

The really important procedure is *PROCpath* which forms the interface with the Draw module. It converts and expands the data stored within the Draw file into a form digestible by the Draw module.

Unfortunately this is not quite as straightforward as it might have been, hence the various bit shifts.

Luckily, though, the actual path data can be passed directly to the Draw module: this is the sequence of 'move', 'draw', and 'curve' instructions that form the outline of the object.

Two calls to the Draw module are made: one for the actual outline and one for the interior of the object.

The appropriate calls are used depending on the values of the outline and fill colours read from the file. If either outline or interior have 'no colour' then nothing happens,

otherwise the *ColourTrans* module is used to set the closest *GCOL* available and then either *Draw_Stroke* or *Draw_Fill* is called to plot the shape.

Bounding boxes

There is a secondary section of code that also deals with the Draw module. This is the 'bounding box' calculator. Every type of object within a Draw file (except a couple of peculiar ones) has an associated bounding box. This is the area of space that the object can affect when it is drawn. Nothing outside this box will change if the object is drawn. The bounding box of a grouped object will totally cover all the bounding boxes of the enclosed objects. Here comes some more recursion!

The procedure *PROCbounds* takes the address and size of a Draw file as parameters. As with *PROCdraw*, it works its way through the file, but instead of drawing paths, it calculates their bounding boxes. Fortunately, one of the 'hidden' calls to the Draw module, *Draw_ProcessPath*, does most of the dirty work for us. Given a path, in much the same way as *Draw_Fill* or *Draw_Stroke*, it returns the bounding box.

My procedure *PROCCalbbox* uses this call to recalculate the bounding boxes of the stretched paths. It also returns the co-

ordinates back to its calling routine to allow the bounding boxes of grouped objects to be set up correctly. Finally, the bounding box of the whole file is set (at the end of *PROCbounds*)

Further maths

The second part of the program, and definitely the shortest, deals with applying the distort transformation. Figure 1 shows the sort of thing we want to achieve. The rectangle ABCD represents the bounding box of an object with point X being an arbitrary point within this box. We want to know the co-ordinates of the point X' after the rectangle ABCD has been distorted into quadrilateral A'B'C'D'.

As with all maths, breaking the problem down into stages and applying some simple principles makes this relatively easy!

The point X, (x,y) can be represented in terms of vectors as: \overline{OX} and likewise X', (x',y') by $\overline{OX'}$.

The transformation therefore involves transforming \overline{OX} into $\overline{OX'}$. Well, I seem to remember from A-level maths that vectors can be split into their components like this: $\overline{OX} = \overline{OA} + \overline{AP} + \overline{PX}$ as shown in the first part of figure 2. The second part illustrates the same process with the desired transformed image.

We only need to transform each of these three vectors in turn and recombine the result. Problem solved! The details are:

Let α be the proportion of the distance along AB that P lies, and β be the propor-

tion of the distance along AD that Q lies.

In other words:

$$\alpha = (x - A_x) / (B_x - A_x)$$

$$\beta = (y - A_y) / (B_y - A_y)$$

$\overline{OX'}$ can thus be found in terms of A,B,C & D as follows:

$$\overline{OX'} = \overline{OA'} + \overline{AP'} + \overline{PX'}$$

$$= \overline{OA'} + \alpha(\overline{OB'} - \overline{OA'}) + \beta(\overline{OR'} - \overline{OP'})$$

$$= \overline{OA'} + \alpha(\overline{OB'} - \overline{OA'})$$

$$+ \beta(\overline{OD'} + \overline{DR'} - (\overline{OA'} + \alpha \overline{AB'}))$$

$$= \overline{OA'} + \alpha(\overline{OB'} - \overline{OA'})$$

$$+ \beta(\overline{OD'} + \alpha(\overline{OC'} - \overline{OD'})) - (\overline{OA'} + \alpha(\overline{OB'} - \overline{OA'}))$$

$$= \overline{OA'} + \alpha(\overline{OB'} - \overline{OA'})$$

$$+ \beta(\overline{OD'} - \overline{OA'} + \alpha(\overline{OC'} - \overline{OD'} - \overline{OB'} - \overline{OA'}))$$

A simple example program called *Distort* (listing 3) has been provided to show this equation in action without all the complication of Draw file interpretation. A simple shape is shown whose corners may be stretched with the Select button.

This vector equation appears twice in the program, once for the X co-ordinates and once for the Ys. Both of these are in *PROCadjust* which is called from the procedure *PROCdistort*. This takes two parameters which are both addresses of Draw files.

These two files should start the same (apart from previous distortions). The first is to read co-ordinates from, the second for storing the new distorted image.

When a file is drawn with *PROCdraw*, a list of addresses of paths is built up starting at the address points. *PROCdistort* goes to each path in turn, finding the co-ordinates within that path (for the moves, draws and curves) and uses *PROCadjust* to transform them.

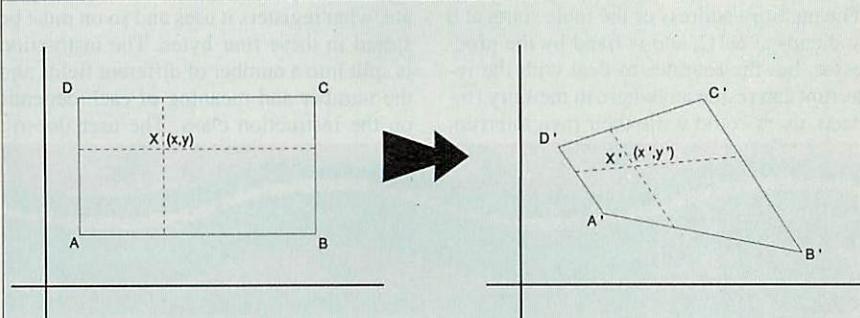


Fig 1. Illustrating the transformation required

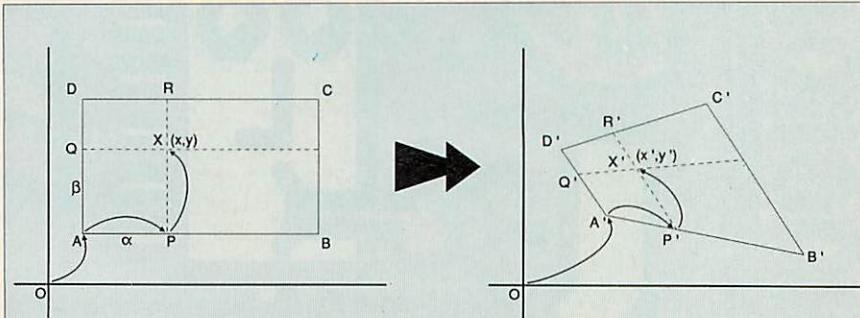


Fig 2. Splitting the transformation into vectors

MAY I INTERRUPT?

Last month I talked in general about the Arm chip. Now I want to look at the instruction set in detail. The first class of instruction only has one member, the SWI (Software Interrupt) instruction. All operating system routines are implemented through this mechanism.

Software Interrupts

An interrupt is an intervention in the computer's normal flow of control, triggered by an outside event. Such a trigger can be provided by the hardware, in which case it is normally outside the user's control. Alternatively it can be produced by software.

An SWI call is a software interrupt. There are a number of interrupts that can occur other than SWI – for example, the RESET signal, which is a hardware interrupt. The operating system has a table of instructions to execute if a particular interrupt occurs.

Normally these instructions will be a branch to the routine that deals with them. The memory address of the table starts at 0 and ends at &1C, and is fixed by the processor, but the routines to deal with the interrupt can reside anywhere in memory (indeed, users could write their own interrupt

handlers if they really wanted to).

An SWI call causes an interrupt to occur. The processor switches into supervisor mode. Supervisor mode allows read/write access to all of the computer's memory. User mode (the standard mode) doesn't allow this, and some areas of the memory are partitioned off to prevent rogue programs writing to certain sections of memory.

Once in supervisor mode, the program counter is stored. It then branches to memory location 8 (the SWI entry in the interrupt table) to deal with the interrupt. This location contains a branch instruction which sends the processor off to the actual SWI handling routine.

The question now is: how does the SWI handler know what routine the program wanted to call? To answer this, I need to explain how Arm instructions are coded.

Instruction coding

All machine code instructions on the Arm occupy a four byte word. All the information about how the instruction should operate, what registers it uses and so on must be stored in these four bytes. The instruction is split into a number of different fields and the number and meaning of each depends on the instruction class. The user doesn't

JASON O'BROIN continues his series on programming the Arm 2 Risc chip with a look at how to use its software interrupt instructions

normally need to worry about this (that is what an assembler is for after all!), but it is instructive to know something about it.

In the case of the SWI call, the top four bits are a code that says which conditions have to be met before the instruction is executed (this is common to all instructions). See figure 1 for details of the different conditions. The next four bits hold a code (1111) saying that this instruction is a SWI. The remaining 24 bits are ignored by the Arm, but are used to specify what operating system routine is being called.

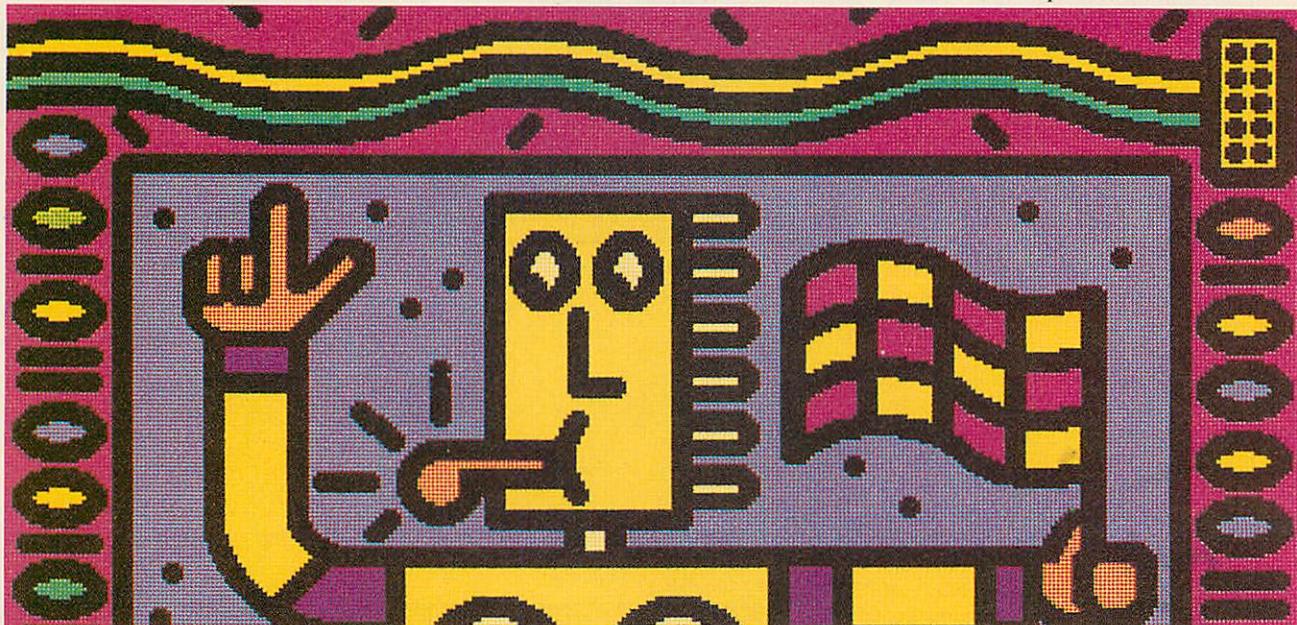
As a result, there are 2^{24} different codes which can be used to specify what routine is required.

SWI decoding

The SWI number is divided up into a number of different parts (see figure 2). SWI numbers are grouped together in blocks of 64 consecutive numbers.

These are called chunks, and each chunk has an identification number (there are 1024 of these), which are generally attributed to different parts of Risc OS. For example, the Wimp Manager has SWI numbers &400C0-&400FF. (The bits that count indicate that this is the third chunk).

The other important feature of the SWI



EXECUTION CONDITIONS

EQ (EQual)	If Z is set
NE (Not Equal)	If Z is clear
CS (Carry Set)	If C is set
CC (Carry Clear)	If C is clear
MI (Minus)	If N is set
PL (Plus)	If N is clear
VS (oVerflow Set)	If V is set
VC (oVerflow Clear)	If V is clear
HI (HIGher)	If C is set and Z is clear
LS (Lower or Same)	If C is clear and Z is set
GE (Greater or Equal)	If N is clear and V is clear or if N and V are set
LT (Less Than)	If N is set and V is clear or if N clear and V set
GT (Greater Than)	As for GE but Z must be clear
LE (Less than or Equal)	As for LT but Z must be set
AL (ALways)	Always, regardless of state of flags
NV (NeVer)	Never, regardless of state of flags

FLAGS

Z : Zero flag	Set when two compared values are equal or if destination result is zero
N : Negative flag	N reflects the state of bit 31 of a result
C : Carry flag	Set if a result is larger than the available bits or during shift operations
V : Overflow flag	Set if there is no carry set or if there is no carry from bit 30 to 31 but there is a carry set

Fig 1. Flag conditions used by SWI instructions

numbers is the 'X' bit which is set by prefixing the SWI name with an X. This indicates that if an error occurs, the routine should return to the calling code with the overflow flag (V) set so that the calling code can deal with it itself. So, an SWI call would change from

SWI "OS_WriteC" to SWI "XOS_WriteC"

More details of the SWI number format can be found in figure 3.

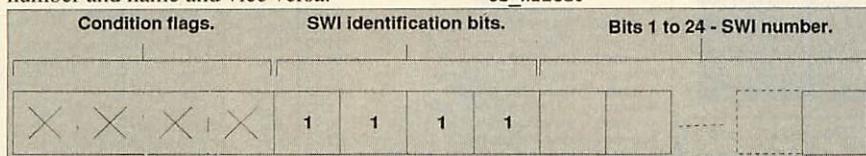
All SWI numbers have an associated name, which can be found in the module that the SWI comes from. The Basic Assembler automatically converts SWI names into their corresponding number, so the use of SWI names instead of numbers is recommended as it helps to improve clarity. The operating system routines "OS_SWINumberFromString" and "OS_SWINumberToString" convert between number and name and vice versa.

Using SWIs

Information for a particular SWI is passed using registers. The numbers that are used depends on the routine, but they start from r0 upwards. Knowing that only r0-r3 (say) are going to be used in the various SWIs you are using means you can leave these registers free, and keep important information in the other registers. All SWIs will preserve the contents of any registers they are not using to pass information back in.

The range of SWI calls available is wide. For example, converting a number into a string and printing it can be performed using only two SWI calls. If r0 contains the number to be printed, r1 a pointer to a resultant string, and r2 the size of the buffer, the following code will print the number:

```
SWI "OS_ConvertCardinal4" SWI
"OS_Write0"
```

**Fig 2. General plan for an SWI machine code instruction**

The OS_ConvertCardinal4 returns the address of the string to print in r0 which is the same register that OS_Write0 requires the address to be in.

Changing the OS_ConvertCardinal4 to OS_SWI NumberToString, and adding a MOV R0,R1 between the two instructions in the above example would print out the name of a particular SWI number.

Listing 1 gives a better demonstration of this by listing out all SWI numbers and their corresponding names. Don't worry if you don't understand how the whole program works. The comments should give you some idea of what is going on and the rest will become clear after I have covered other instructions in future articles.

Bits and pieces

As listing 1 shows, data can be stored within the machine code program using the directives EQUS, EQUB and so on (see figure 3 for full details). These work by instructing the assembler to store the data at that point in memory. The number of bytes taken depends on the directive.

This can present a problem, though. Due to the way the Arm works, all instructions must be word-aligned, meaning that because Arm instructions are four bytes long, the instructions must be consecutively arranged, and hence have to be at an address divisible by four.

The reason for this is because the program counter assumes that the bottom two bits of an address are 00 (and, by implication, that all the instruction addresses are multiples of four), and so uses these two bits in the program counter for another purpose.

Should you find that by entering data the next address isn't word aligned, the directive ALIGN will instruct the assembler to use the next word-aligned memory location to continue assembling from.

The SWI instruction is an extremely powerful way of interacting with the operating system. The time overhead in finding which SWI should be executed is generally not high enough to cause too many problems.

Next month I will look at data processing operations as these comprise the bulk of instructions the Arm recognises.

SWI number format	
bits 20 - 23	Operating system identification Risc Os = 1000 Risc iX = 0000
bits 18 - 19	Determines which part of the system implements the SWI 00 = Operating system 01 = Operating system extension modules 10 = Third party resident applications 11 = User applications
bit 17	The 'X' bit. Determines action on errors
bits 6 - 16	SWI chunk identification number
bits 0 - 5	Identifies individual SWI's in a chunk

Fig 3. Details of the SWI number format

TESTS OF CHARACTER

The uses of image analysis range from checking tomato ketchup bottle labels to clearing cheques.

DAVID KNELL explains how it can make things easier

Last month I explained how to analyse images consisting of blobs and extract information from them using relatively simple techniques. This month I can reveal problems with that type of analysis and as well as other problems, such as character recognition and position checking. Aliasing causes problems when trying to analyse objects which are only a few pixels in area.

The two-by-two pixel object in figure 1 obviously has an area of four, no matter what the threshold, if it lies exactly on four pixels of our image.

When displaced by half a pixel, as shown, then its apparent area may be anywhere between one and nine pixels.

The pixels which are partially occupied by the object will have a grey level somewhere between the background and object levels, and hence are susceptible to small changes in threshold.

Recognise this from somewhere? It's exactly the same process as anti-aliasing, as discussed in the first article in this series.

Anti-aliasing uses the range of grey levels available to allow the edges of objects in an image to be displayed to a resolution greater than one pixel. This procedure can be reversed. You can take an anti-aliased image and locate the edges of objects in it to an accuracy closer than one pixel. This process is called interpolation.

Interpolation allows us to guess how the grey level of an image varies between the

centres of pixels. It's quite a simple process – figure 2 gives the general idea in one dimension. Given a set of values at locations 0, 1, 2 and 3 along the line, simply draw straight lines between pairs of points to determine the grey levels in between them. This is called first-order (or linear) interpolation, as since a first-order equation (meaning a straight line) is used to perform the interpolation.

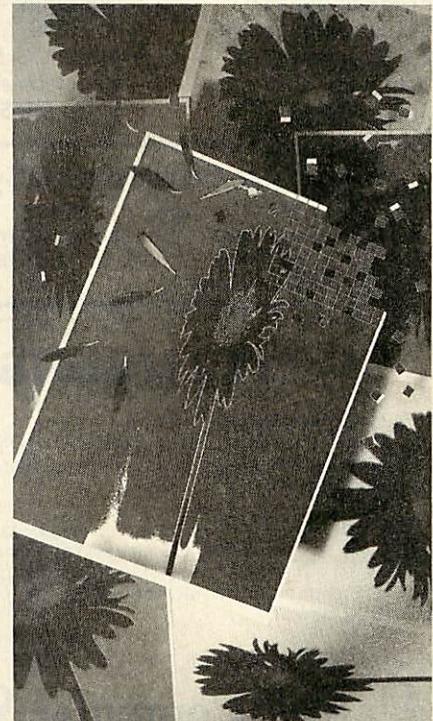
It is possible to use higher-order equations, but the gain in precision falls off as the computation required increases. Third-order interpolation (using cubic equations, where a curve is fitted through four points) is all that is needed.

The first program this month, *Interpol* shows this procedure in action. It randomly positions a two-by-two square on a pixel grid and calculates its area using straight thresholding and linear interpolation.

The yellow dots drawn on the red object show where the interpolation routine thinks it is – it manages a pretty fair guess. For the threshold used (40), the simple threshold gives areas between three and six pixels – the interpolating one is rarely outside the range 3.7 to 4.3.

Optical character recognition

Optical character recognition (OCR) is another aspect of image analysis. Here, instead of asking for a simple description of an object in an image, a program has to decide which character the object corresponds to. This is usually done by matching



the object found with a set of templates – each of which is one of the letters of the alphabet – and choosing the template which differs least from our object.

So, how are templates matched with objects in an image? The simplest method is to overlay the object with each template in turn and count the number of pixels which differ between the two. This gives us an error value, and choosing the template with the lowest error value should provide us with the best match.

A better method is to add in the distance (or even its square) from the pixel which differs in the template to the nearest one of the same colour in the object. By doing this, errors due to noise around the edges of objects are not taken much notice of, and large deviations are magnified. This sort of pixel-by-pixel comparison is, of course, somewhat limited. It can only cope with those fonts it recognises, and then often only in certain sizes. It is possible to just use one set of templates for a font, but they then need to be scaled to fit the size of character which is being recognised. Another way of recognising characters, which overcomes these problems but has a number of its own, is by looking at the character and counting features.

These include loops, ends and junctions and different characters have different combinations of these. Unfortunately this cannot separate out all the different characters: d and b both have one loop and one end. Hence more (and more complex) processing is needed to relate these features to each other to allow recognition of all characters – the result is slower (and probably less reliable) recognition than a simple OCR

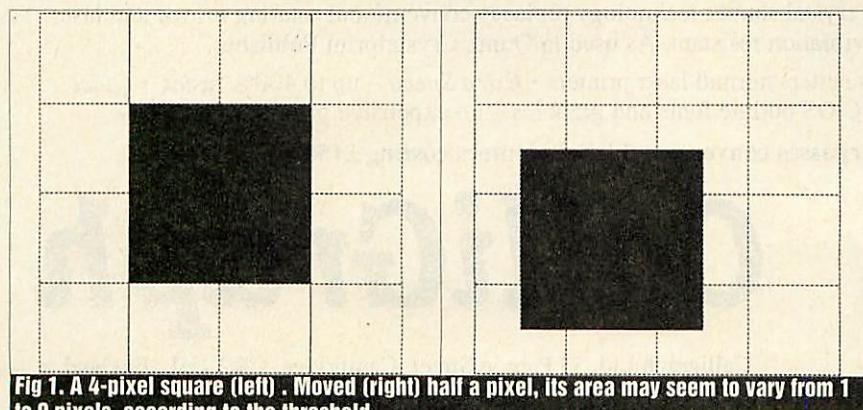


Fig 1. A 4-pixel square (left). Moved (right) half a pixel, its area may seem to vary from 1 to 9 pixels, according to the threshold

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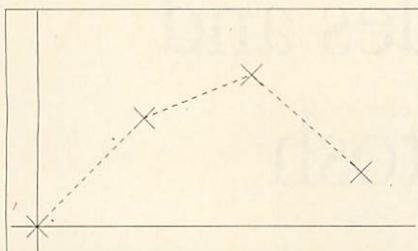


Fig 2. How grey levels of pixels can vary

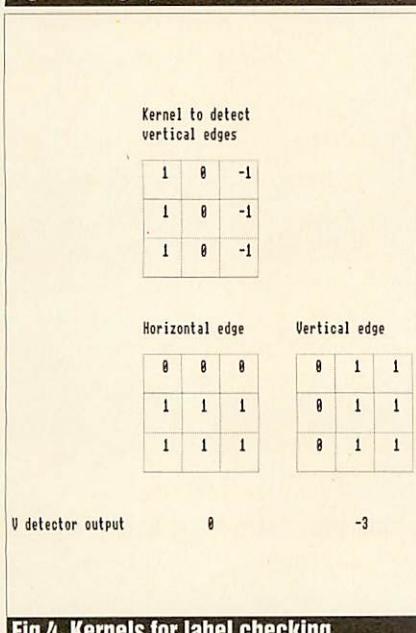


Fig 4. Kernels for label checking

system, but this is counterbalanced by the system not having to be trained in each size of each font to be used.

The second program performs simple OCR on characters on-screen, using the straight comparison method: unsurprisingly, it manages 100 per cent accurate recogni-

tion, as the pixel patterns on-screen can be guaranteed to be the same as the templates.

Ketchup with technology

What on earth does image analysis have to do with tomato ketchup bottles? Well, it's used in the manufacturing process to see if the bottles' labels are on straight. Not exclusively for tomato ketchup, either: any industrial process that uses labelling can benefit from these methods.

In a typical bottling plant, bottles are held at top and bottom and whisked along past a machine which labels them, one that fills them and one that screws the lids on. Between the labelling and filling the label's position can be checked.

A typical image as seen by the camera is shown in figure 3. A few steps are followed to determine the straightness of the label:

- Find the left-hand edge of the bottle. Remember that the bottles are moving, and hence the edge of the bottle in the image may well not appear at the same place all of the time. Since the bottles are only moving horizontally, we can assume that the bottom edge is fixed.
- Check that the label is on in the right place. This can be done by making sure that the left-hand edge of the label is the correct distance from the left-hand edge of the bottle, and that the label's top is the correct distance up the bottle.
- Make sure it's not rotated. The position of one of the edges of the bottle is measured at a couple of points to do this; the difference between the two can be used to calculate the angle.

What features of the image are used to find these? Well, the place where background becomes bottle is marked by an

edge in the image – it goes from white to grey. And the transition from bottle to label is similarly marked. So, if these edges are detected, the job is nearly done. Remember the first article on convolutions? Remember the edge detector? (There's a brief recap in figure 4 for those reprobates who missed it). The edge detector can be used to detect the position of the edge of the bottle for us, simply by moving the kernel to detect vertical edges along a horizontal line (a 'check-line') which goes over the edge. The position on that line at which the edge detector gives maximum output can be taken to be the position of the edge.

Once we have found the edge of the bottle, we then define three check-lines relative to it to find the label (see figure 5 for the image with the check-lines added). The vertical check-line lets us determine whether the label is at the correct vertical position on the bottle and the two horizontal ones let us work out both the horizontal position of the label and its rotation.

If the vertical edges found are at $x1$ and $x2$, then the edge of the label is at $(x1+x2)/2$ and its angle of rotation is $180*(x2-x1)/((y2-y1)*\pi)$, where $y2$ and $y1$ are the y co-ordinates of the check-lines (only accurate if $x2-x1$ is small).

We can then see if the horizontal and vertical displacements and rotation are within acceptable limits and reject the bottle if they are not.

The third program with this article demonstrates this technique. The results are not absolutely accurate, of course – this is again due to the image being stored as pixels.

Next month: a look at mathematical image generation including Lissajous figures and various fractals.

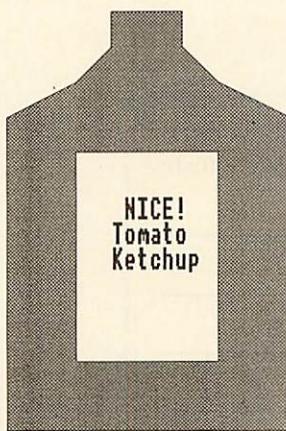


Fig 3. Raw image of a ketchup bottle as seen by the camera

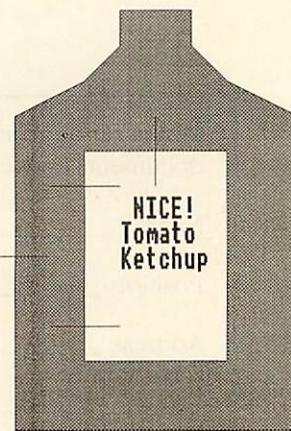
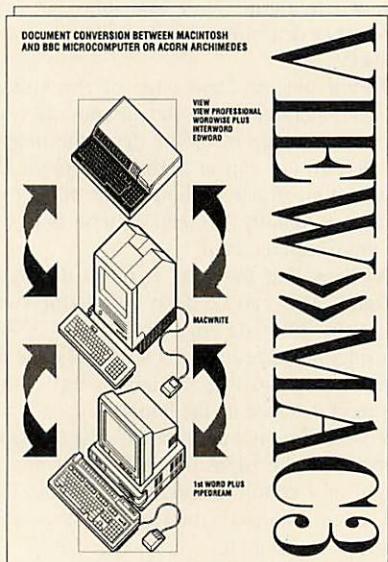


Fig 5. Bottle with check-lines showing

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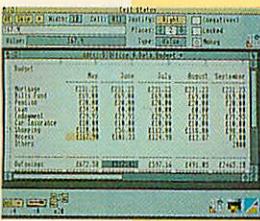
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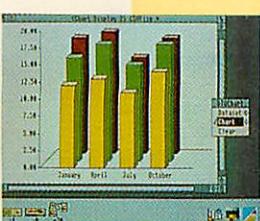
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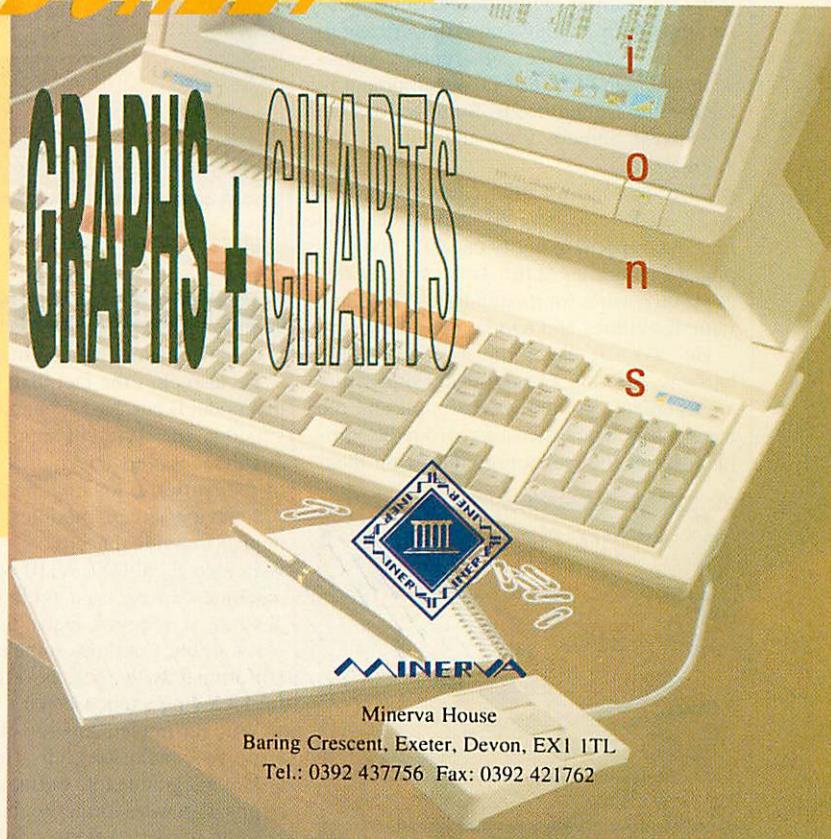
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The BBC B has proved to be an effective tool for children with special educational needs, enabling control of the computer via a variety of input devices and communication and access to information that was previously impossible.

How well does the Archimedes series continue this tradition? Does a 32-bit Risc solution mean 'overkill' in situations that are successfully being met by the BBC B and Master 128 machines? This month and next I shall examine the role that Arcs can play in special needs education.

The four Semercs* – Bristol, Redbridge, Manchester and Newcastle – were the hub of hardware and software for special education until their demise at the end of March 1989, when their roles were devolved to the local education authorities. In reality, this meant only those authorities with either sufficient funding or interest could provide a structure for continuing special needs development.

Oldham LEA committed itself early on to providing support through the Northwest (ex-Manchester) Semerc. During the past year the Northwest Semerc and NCET** have published a variety of materials available as Blue Files, which may be bought ready-prepared at a nominal price.

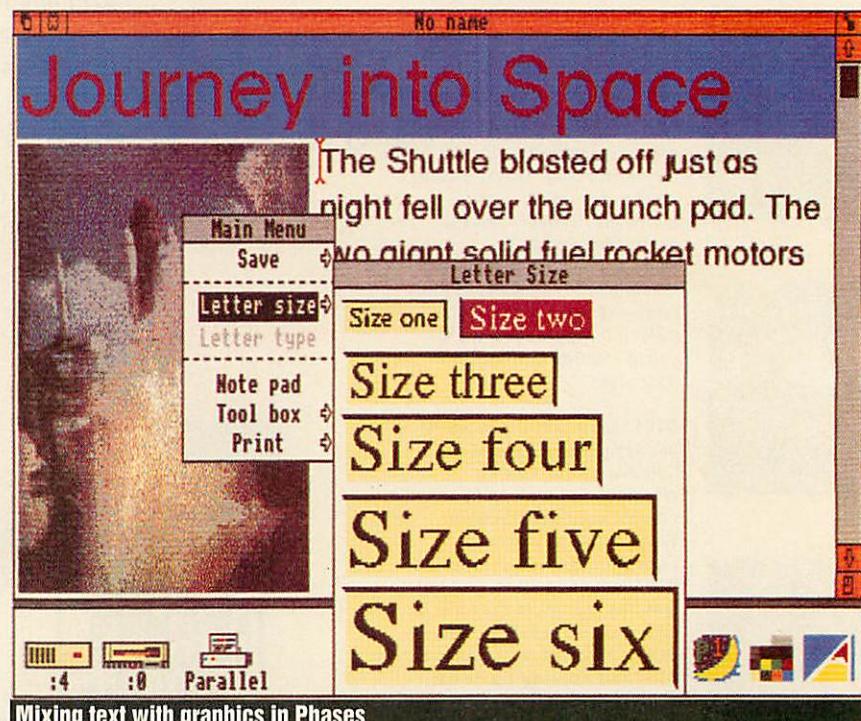
The fact that the Northwest Semerc has some 43 Blue File titles alone, and last year distributed 42,000 discs of special needs software, testifies to the success of this consortium. With 17 LEAs now subscribing to the Semerc's services, it arguably represents the main thrust of IT development in the area of special needs. So how does the Northwest Semerc view the role of the Archimedes?

Director Martin Littler clearly approves of 32-bit Risc technology and he sees the improved speed, memory capacity and graphical capabilities of the Archimedes series as prime reasons for its suitability for people with disabilities and handicaps.

He says, 'It meets the user more than halfway, offering a friendly and supportive environment. It removes the pupil and the teacher a welcome step away from the complexities of the technology, allowing them

SPECIAL AGENT

For children with special educational needs, the BBC B has been a useful avenue for communication and self-expression. **CHRIS DRAGE** asks whether the Archimedes can successfully continue this tradition



to concentrate on the learning task.'

He also cites the fact that, whereas with the model B purchasers had to buy separate versions for different input devices, the Archimedes' version requires only one copy of the software, loading any necessary input device/screen modules to suit each pupil's individual needs.

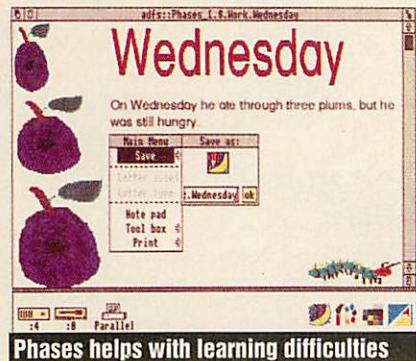
Before an A3000, A310 or A400 series machine can be used with various input devices, it requires expanding in several ways. Table 1 outlines some combinations. Unfortunately there is, as yet, no provision for including a touchscreen.

With the implementation of the Warnock Report's conclusions, all schools face the task of integrating into the mainstream those pupils who were formerly placed in special schools or remedial departments for rea-

sons of mental or physical handicap or social, educational or emotional deprivation.

The task of preparing the ordinary classroom teacher in primary and secondary schools to cope with this situation involves a level of training and support that still has not yet been achieved in many schools. To spearhead help in this area the Northwest Semerc has introduced *Phases*, a series of programs which is designed to support the child with special needs in the mainstream environment.

Phase#1 is the first of a family of wordprocessing programs to be 'phased' in and it includes a number of features that users of *Caption*, *Folio* and *FP Extra* have frequently asked for: easily created graphics screens, variable sized text and the ability to pop pictures into the text area.



Input device	Expansion required	Supplier
	A310/400 series	A3000
Mouse	none	none
Trackerball	none	none
Delta Cat	none	none
Concept Keyboard	I/O podule	User/analogue
Micro Mike	I/O podule	User/analogue
Switches	I/O podule	User/analogue
Switch access box	none	none
* Supplied by Acorn for the A310/400, HCCS/Morley for the A3000		

Table 1. Special needs add-ons

It is basically a type-in and print-out wordprocessor which aims to be easier to use than any of the above programs, yet combines the best features of each.

Particularly exciting is the ability to pick up a coloured sprite from a directory, drop it onto a page of text and watch the writing flow around the picture to make an attractive illustrated story, description or poem.

Similarly, drop a border onto the page and the text squeezes nicely inside it. A library of borders and graphics is under way which should encourage children to work in all areas of the curriculum.

Martin Littler hopes that a library of support materials will grow to provide a versatile introductory combined wordprocessor and DTP package for those tackling key stages 1 and 2 (including secondary special educational needs).

Suitably sophisticated

Phases is very suitable for children with moderate learning difficulties, including the visually impaired. It has a wide choice of text and screen colours and print sizes. *Phases#1* multi-tasks and can work with spelling checkers, thesauruses (for instance *Keyword*) and Concept Keyboard utilities.

When all the *Phases* family is in place its total cost will be in the region of £40 to £50, comparable with both Archimedes *Folio* and *Pendown Plus*. However, that is where the comparison ends as these wordprocessors offer many more features and are more sophisticated.

But the Northwest Semerc's involvement with the Archimedes does not stop there. Five popular eight-bit packages are now running on the Arc under emulation.

The 11 Allan Nixon Keyboard Programs use either the keyboard or Concept Keyboard for input. The activities range from number and letter recognition games to Snap and simple mazes and puzzles. Frequently, there is the option for the teacher to create new versions of the game. A4 and A3 overlays are provided.

The very popular *Infant Disc* (originally in MEP's *Infant Pack*) has been converted for use with the Archimedes. This suite of five programs has also been modified for use with the Concept Keyboard. Again both

A4 and A3 overlays come with the pack.

Lists, another Alan Nixon package, is an ideal starting point for data handling. It is a friendly program that guides children through creating, saving and using datafiles.

Moving In was also very popular as an eight-bit program. In fact, it was voted second out of the 50 programs in the Northwest Semerc's own software survey published in January. The child is offered an empty five-room house with the front removed. The aim is to place furniture, household objects and people in any of the rooms. As the child enters instructions the rooms change accordingly.

There is an option to use Concept Keyboard input at three levels of difficulty. A 'completed' house can be printed out or saved to disc for further modification later. The package includes two overlays suitable for use with *Phase#1*.

Sid and Mike is a suite of five programs for use with the Micro Mike voice input device. It aims to motivate children to experiment vocally and should encourage those who are reluctant to vocalise. Simple animation effects can be controlled by making sounds into the Micro Mike.

To make use of this software, an A3000 requires a user port/analogue port internal podule, while a 400 series computer needs Acorn's I/O Podule.

Despite the above examples, it would be a mistake to assume that the Semerc's only occupation is software publication. It is heavily engaged in in-service training and hardware/software research and development. It also publishes a regular special needs newsletter called *Copy* which is full of interesting case studies and reviews of how people are coping with new computers like the Archimedes.

One fundamental fact that should be remembered is that special needs software can be effectively used in a variety of other areas of the school and home. In my family both *Sid and Mike* and the *Blob* programs from Widgit Software have proved very successful with my two-year old.

The reverse is similarly true. As we shall see next month, even sophisticated computer games, such as those from Fourth

Dimension, have a role to play for those suffering physical disabilities. It is a question of looking at childrens' particular needs and examining the software closely to ascertain whether it can meet those needs.

The Northwest Semerc software survey identifies 90 useful software packages. However, it is significant and indicative of how special needs education is served by the computer industry when, out of the 90, 17 run on the RM Nimbus; one runs on the Apple Macintosh; a handful run on the Archimedes series; and the vast majority run on the BBC B/Master 128.

Offering alternatives

These statistics are disappointing for anyone wishing to give learners access to powerful new machines. The good old Beeb had a wealth of different sockets into which a wide variety of input devices could be attached. According to Semerc's survey document, 'It is as if the British computer industry has forgotten that children benefit from alternatives to the Qwerty keyboard. If the new machines support these devices at all it is through expensive and/or unobtainable extra ports and podules.'

However, the situation is rapidly changing, especially for Archimedes and A3000 users. Next month I will look at a number of useful software packages which, together with suitable input devices, are helping to equip children with special needs with a better range of learning resources.

The programs will all be on show at the Northwest Semerc's *Mics for Special Needs* Exhibition at Oldham in October.

Phase#1 £10, *Allan Nixon Keyboard Programs* £3.50, *Infant Disc* £5.50, *Lists* £3.50, *Moving In* £5.50 and *Sid and Mike* £3.50 from Northwest Semerc, Fitton Hill CDC, Rosary Road, Oldham OL8 2QE.

* Semerc - Special Education Micro Electronics Resource Centre. The Northwest Semerc is at Fitton Hill Curriculum Centre, Rosary Road, Oldham OL8 2QE. Tel: 061-627 4469

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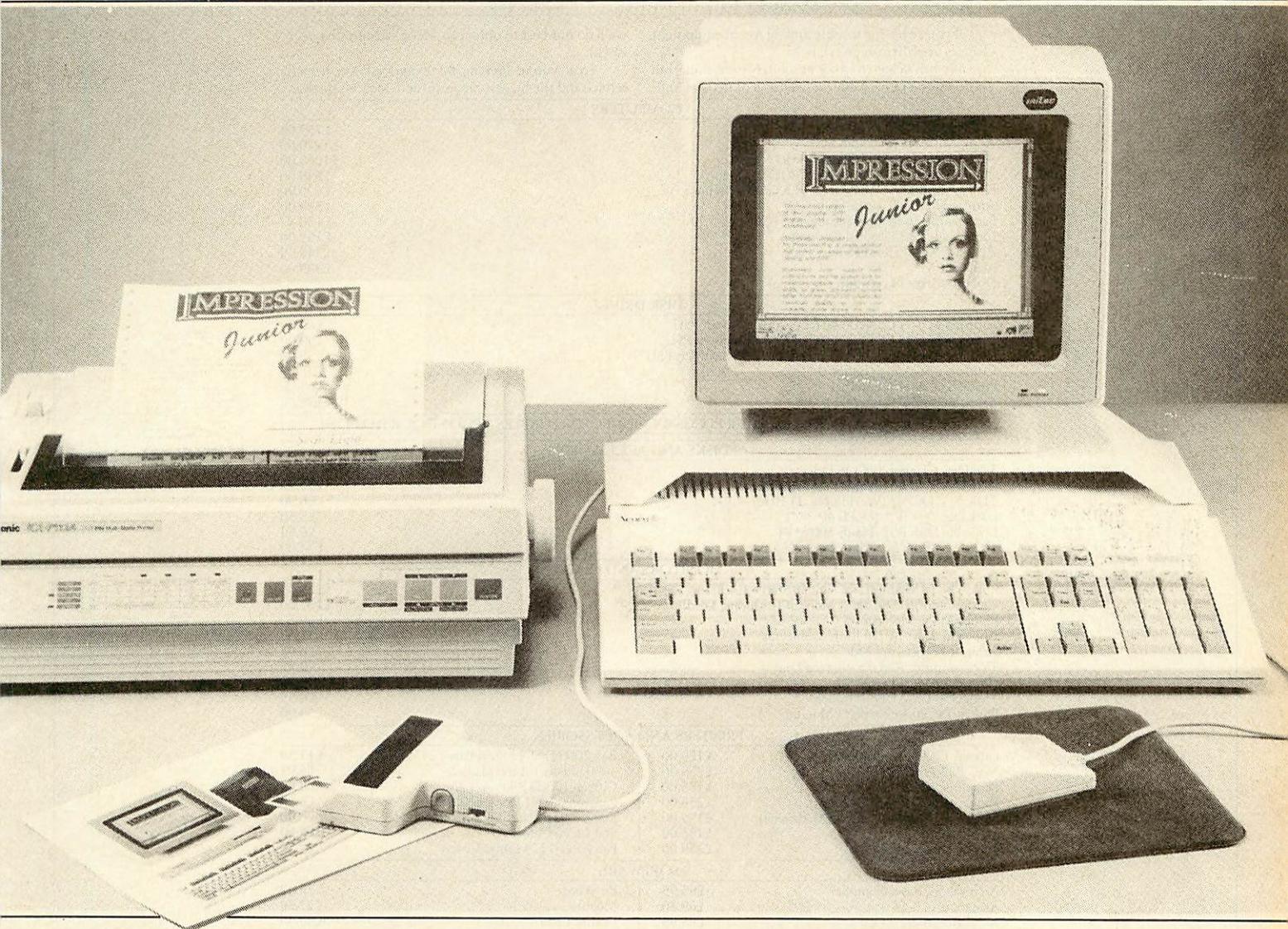
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The manual includes a step-by-step introduction to Impression Junior. The tutorials take you, from scratch, through creating simple letters, multi-page documents and typical DTP type pages. The package also includes the highly acclaimed 'DTP at a glance' book.

If you have been overwhelmed by the capabilities of other DTP programs, or

enhanced word processing



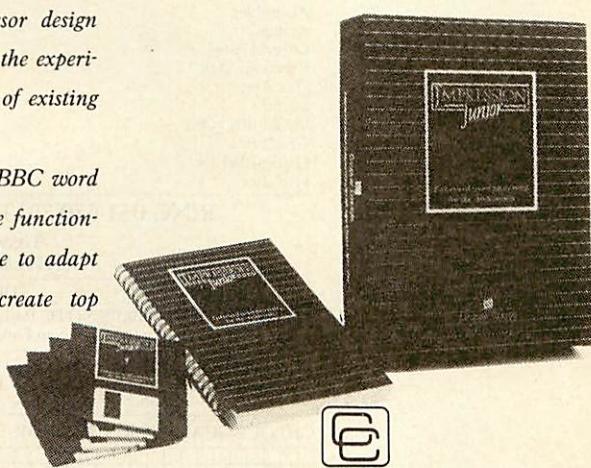
simply don't require all the powerful features these may provide, then *Impression Junior* is the answer. And remember it is part of a family of products so that as your experience grows and your requirements evolve there is always a version of *Impression* to suit.

There can never be one single product that caters for all word processing and DTP requirements, and so *Impression Junior* has been created specifically for those new to DTP or those who want to take their word processing one step further.

Created by the team that produced *Wordwise*, *Inter-Word* and *Impression*, probably

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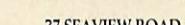
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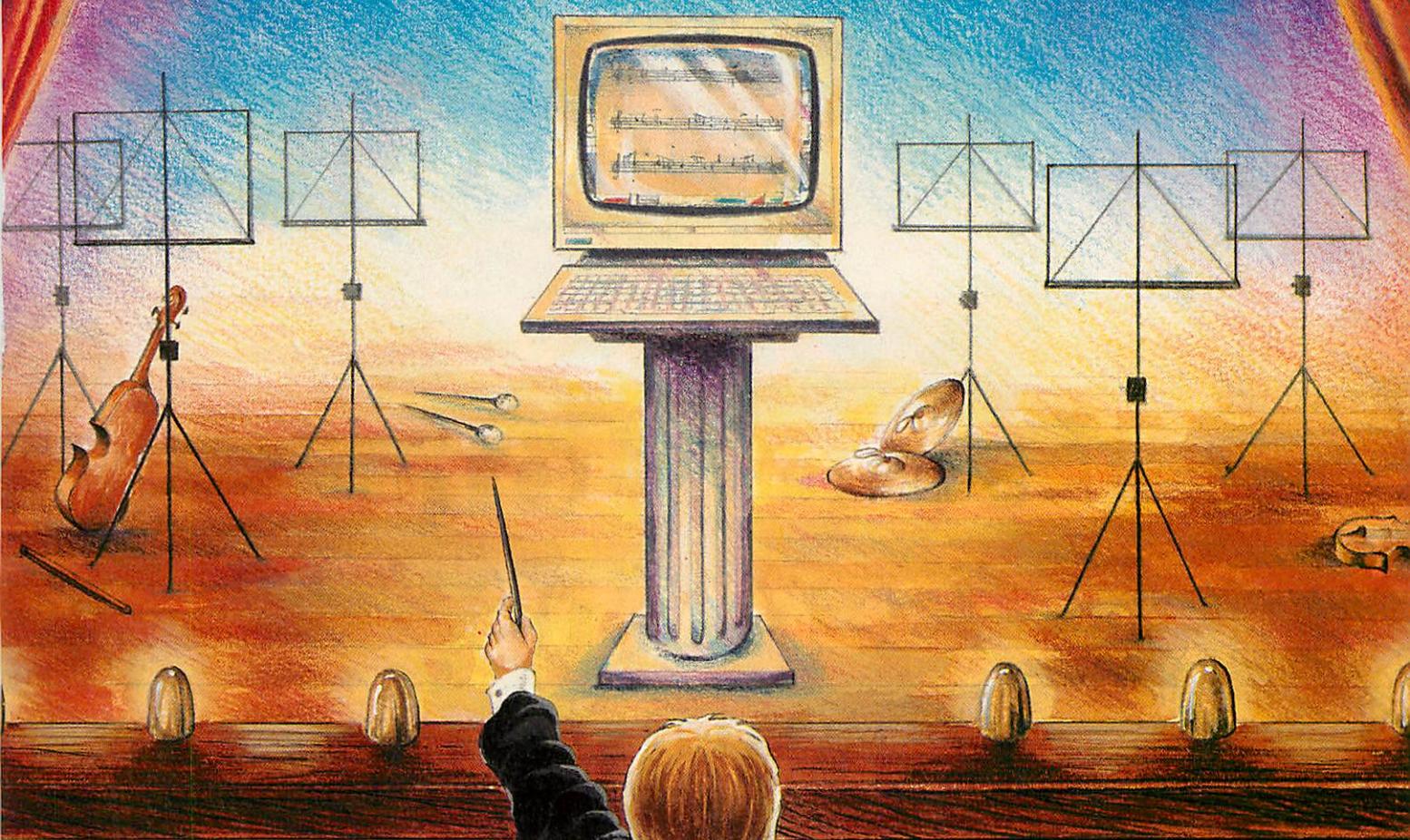
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• Rhapsody in Blue •

by
adapted and performed, Julian (aged 7½ years)



Gershwin, Mozart, Vivaldi, all scribbling away, frantically composing their masterpieces, oh, to have had something a little more practical than pen and ink.

Imagine their delight had they seen Rhapsody. A new music notation package from Clares that allows you to write and modify musical scores in much the same way as a word processor allows you to manipulate text.

You can enter the music manually note by note. Or simply play the music in using a MIDI interface and a MIDI keyboard. Using a standard RISC OS printer Driver, pages, whole scores or individual parts can be printed out. What's more, Rhapsody also accepts Maestro files allowing Maestro scores to be played and printed.

As you would expect, Rhapsody enables you to enter dotted notes, triplets, staccato and accented notes, trills, repeats and much, much more. There is also the ability to add text, so you can easily add lyrics. And five

scores can be open at once allowing you to copy data between them.

All of this can be replayed via a MIDI or an Archimedes sound system, it's childsplay, as successfully proved by Julian.

In short, it makes the labour of composing (noting, writing, correcting and changing) quick and easy, allowing you time to concentrate on the important part; the music.

Just think had Schubert had Rhapsody, perhaps his famous unfinished might have been finished. **PRICE - £49.95 (inc VAT).**



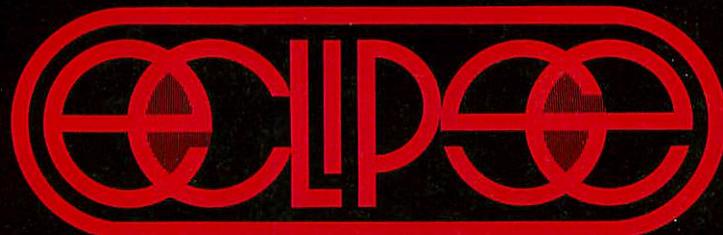
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COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/Turbo	ADFS	Econet	Shadow Ram	Monthly Disc
Risc Revue	57											
Listing 1								■	■	■	■	■
Listing 2								■	■	■	■	■
Listing 3								■	■	■	■	■
Listing 4								■	■	■	■	■
Listing 5								■	■	■	■	■
Eight Bits	59							■	■	■	■	■
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Listing 2		■	■	■	■	■	■	■	■	■	■	■
Listing 3		■	■	■	■	■	■					
Listing 4		■	■	■	■	■	■					
Ray Tracing	65											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Listing 2								■	■	■	■	■
!Stretch	72							■	■	■	■	■
Arm Programming	74							■	■	■	■	■
Image Processing	79	■	■	■	■	■	■	■	■	■	■	■

RISC REVUE

Listing 1

```

10 REM >!RunImage (RR1)
20 REM Changing the pointer demo
30 REM by Joe Abley
40 REM for Archimedes only
50 REM (c) BAU September 1990
60 :
70 DIM task%, block%, 512, main%, 200, i
nd%, 64
80 $task%="TASK"
90 SYS "Wimp Initialise", 200, !task%
ptrDemo TO task_handle%
100 :
110 ON ERROR PROCerror(TRUE):END
120 SYS "Wimp_OpenTemplate", "<ptrdemo
$dir> Templates"
130 SYS "Wimp_LoadTemplate", , main%, ind
%, ind%+64, -1, "main", 0
140 SYS "Wimp_CreateWindow", , main% TO
main_handle%
150 SYS "Wimp_CloseTemplate"
160 !blocK$=main_handle%
170 SYS "Wimp_GetWindowState", , block%
180 SYS "Wimp_OpenWindow", , block%
190 ON ERROR PROCerror(FALSE)
200 own%:=TRUE
210 mask%:=%10000001100100000011
220 finished%:=FALSE
230 WHILE NOT finished%
240 SYS "Wimp_Poll", mask%, block% TO re
ason%
250 CASE reason% OF
260 WHEN 2:SYS "Wimp_OpenWindow", , bloc
k%
270 WHEN 3:SYS "Wimp_CloseWindow", , blo
ck%:finished%:=TRUE
280 WHEN 4:PROCdefault_pointer
290 WHEN 5:IF !block%:main_handle% THE
N PROCmy_pointer
300 WHEN 17,18
310 CASE block%:16 OF
320 WHEN 0:finished%:=TRUE
330 WHEN &4001:IF own% THEN PROCmy_po
inter
340 ENDCASE
350 ENDCASE
360 ENDWHILE
370 SYS "Wimp_CloseDown", task_handle%
!task%
380 END
400 DEF PROCerror(fatal%)
410 PROCdefault_pointer
420 SYS "Wimp_DragBox", , 0
430 !block%:=ERR
440 $!block%:4)=REPORTS+" (internal er
ror code "+$TRSERL+""
450 SYS "Wimp_ReportError", block%, 1, "P
ointer Demo"
460 IF fatal% THEN
470 P%:=b%:p%:=1

```

```

470 SYS "Wimp_CloseDown", task_handle%
!task%
480 ENDIF
490 ENDPROC
500 :
510 DEF PROCdefault_pointer
520 *pointer 1
530 own%:=FALSE
540 ENDPROC
550 :
560 DEF PROCmy_pointer
570 SYS "Wimp_SpriteOp", 36, 1, "ptr_cros
s", 2, 8, 5, 0, 0
580 own%:=TRUE
590 ENDPROC

```

```

000
80 DIM w% free%
90 READ app$
100 REPEAT
110 PROCins(app$)
120 INPUT "Enter destination directory:
$app$"
130 IF app$="" app$="0"
140 SYS "XOS_File", 5, app$ TO type%
150 UNTIL type%:2
160 REPEAT
170 READ files
180 IF file$<>" " THEN
190 files:="app$+"."+file$
200 PRINT "Creating file ""file$"""
210 READ load%, exec%, olen%, attrib%
220 p%:=0
230 d$:=""
240 d$:=1
250 WHILE p%<olen%
260 b%:=FnB
270 IF b%<130: p%:=w%:FnB:=p%+1
280 IF b%>=131 AND b%<=162 THEN
290 n%:=b%:128
300 fx:=p%-FnB
310 FOR i%:=0 TO n%-1
320 ?(w%+p%+i%)=(w%+fx+i%)
330 NEXT
340 p%+=n%
350 ENDF
360 IF b%<130 OR b%>162 THEN
370 p%:=b%:p%:=1

```

```

380 ENDIF
390 ENDWHILE
400 SYS "OS_File", 0, file$,, w%, w%+p%
410 SYS "OS_File", 1, file$, load%, exec%, attrib%
420 ENDIF
430 UNTIL file$="*"
440 PRINT "Files created"
450 END
460 :
470 DEF FnB
480 LOCAL b%, c1%, c2%, i%
490 IF d$="" THEN
500 READ d$, c1%
510 c2%:=0
520 FOR i%:=1 TO LEN(d$)/2
530 c2%:=VAL("0"+MID$(d$, 2*i%-1, 2))
540 NEXT
550 IF c1%<(c2% MOD 100) PRINT "Error
in Data Line " ; d$; END
560 d$:=1
570 ENDIF
580 b%:=VAL("0"+LEFT$(d$, 2))
590 d$:=MID$(d$, 3)
600 b%=
610 :
620 DEF PROCins(i$)
630 LOCAL 1%
640 FOR i%:=1 TO LEN(i$)
650 SYS "OS_Byt", 138, 0, ASC(MID$(i$, i%,
1))
660 NEXT
670 ENDPROC
680 :
690 DATA !ptrDemo
700 DATA "ptrDemo"
710 DATA &FFFFF942, &848A58E54
720 DATA &2CC, &83
730 DATA 02000000108304083094C, 77
740 DATA 830217074726645606F83, 71
750 DATA 170003871C840C783282C, 55
760 DATA 8323C010000083547782, 80
770 DATA 9E77829979E8297829782, 6
780 DATA 9E7782878288F8830F8299, 85
790 DATA B2979979798299798297, 46
800 DATA 777828828F0000F8298, 14
810 DATA B2997007677829982982, 70
820 DATA 99798287F882883107882, 50
830 DATA 9E70777D0E7E7777829782, 36
840 DATA 99777841077D7777077, 51
850 DATA B298E82997978288842082, 99
860 DATA 8878770411EE77778287, 90
870 DATA 0886740077832284338583, 97
880 DATA 7077783217EDEE77E86, 11
890 DATA 10EEEDE77707EEEEE87, 16
900 DATA 20E7EE707D784584884, 3
910 DATA A2331E70707EE862F840, 47
920 DATA E78433E0787208510E83, 62
930 DATA 338660000770783408A21, 98

```

```

940 DATA 077EE7835377884207EEEEE, 82
950 DATA E783917D083C683A083578, 18
960 DATA EEE835083A3835689628968, 39
970 DATA 9012FF8F238310F081484, 74
980 DATA 20FF8F25F09011F8FB2283, 31
990 DATA 218E58FFF0F8E620F9078, 75
1000 DATA F08E2192996021924296FD, 22
1010 DATA 7483FF7074725F63726F73, 78
1020 DATA 7383F00183FF08877F840, 28
1030 DATA 2C83F08304861448A85FA, 38
1040 DATA 82A002022A84F08000280, 61
1050 DATA 84FA0283F830400A2A82, 47
1060 DATA A0A880C84148820883087, 17
1070 DATA 4000, 64
1080 DATA "Templates"
1090 DATA 8FFFFEC42, &848974544
1100 DATA 8A2, 83
1110 DATA FFFFFFFF00000000803485, 88
1120 DATA 072C830D7683101831560, 23
1130 DATA 61696E0D886D8C83295083, 48
1140 DATA 19F40300008028A368444, 50
1150 DATA 120003F0702070103010C, 9
1160 DATA 846FFC835805865A3D846D, 83
1170 DATA 30865486C5887341E8779, 67
1180 DATA 546865204160617A696E67, 32
1190 DATA 204368616E78409506F99, 50
1200 DATA 6E746572210D, 87
1210 DATA *

```

Listing 2

```

in Data Line " ; d$; END
560 d$:=1
570 ENDIF
580 b%:=VAL("0"+LEFT$(d$, 2))
590 d$:=MID$(d$, 3)
600 b%=
610 :
620 DEF PROCins(i$)
630 LOCAL 1%
640 FOR i%:=1 TO LEN(i$)
650 SYS "OS_Byt", 138, 0, ASC(MID$(i$, i%,
1))
660 NEXT
670 ENDPROC
680 :
690 DATA !ptrDemo
700 DATA "ptrDemo"
710 DATA &FFFFF942, &848A58E54
720 DATA &2CC, &83
730 DATA 02000000108304083094C, 77
740 DATA 830217074726645606F83, 71
750 DATA 170003871C840C783282C, 55
760 DATA 8323C010000083547782, 80
770 DATA 9E77829979E8297829782, 6
780 DATA 9E7782878288F8830F8299, 85
790 DATA B2979979798299798297, 46
800 DATA 777828828F0000F8298, 14
810 DATA B2997007677829982982, 70
820 DATA 99798287F882883107882, 50
830 DATA 9E70777D0E7E7777829782, 36
840 DATA 99777841077D7777077, 51
850 DATA B298E82997978288842082, 99
860 DATA 8878770411EE77778287, 90
870 DATA 0886740077832284338583, 97
880 DATA 7077783217EDEE77E86, 11
890 DATA 10EEEDE77707EEEEE87, 16
900 DATA 20E7EE707D784584884, 3
910 DATA A2331E70707EE862F840, 47
920 DATA E78433E0787208510E83, 62
930 DATA 338660000770783408A21, 98

```

Listing 3

```

10 REM >Powers (RR3)
20 REM by A Reysenbach
30 REM for Archimedes only
40 REM (c) BAU September 1990
50 :
60 MODE 0
70 CLS
80 INPUT "Number? " numb%
90 PRINT
100 INPUT "Raise to what power? " exp%
110 IF numb%>2 OR numb%>199526131 OR e
xp%>2 THEN
120 Log=LOG(numb)
130 dupnumb%=numb%
140 dupexp%:=exp%
150 Len%:=exp%*(log+.00000002)+1
160 DIM fig%(Len%)
170 fig%(1)=1
180 begin%:=1
190 carry%:=0
200 speedup%:=8.3/log
210 IF speedup%>exp% THEN speedup%:=1
220 rest%:=exp% MOD speedup%
230 numb%:=numb%*speedup%
240 exp%:=exp%/speedup%
250 PROTraise
260 IF rest%>0 THEN

```

Continued ►

◀ Continued

```

270 numb% = dupnumb%
280 begin% = dupexp% - rest% + 1
290 exp% = dupexp%
300 PROCraise
310 ENDIF
320 CLS
330 PRINT STR$(dupnumb%); " ^ "; dupexp%
;" is exactly"
340 PRINT
350 a% = 1
360 FOR FX = (len% TO 1 STEP -1
370 PRINT fig$(FX);
380 NEXT
390 PRINT ""(Which is about ";fig%(len%
%;" x 10";" + STR$(len% - 1);")"
400 END
410 :
420 DEF PROCraise
430 FOR raise% = begin% TO exp%
440 FOR place% = 1 TO raise% * (LOG(numb%)
+ .000000002)+1
450 help% = numb% * fig%(place%)+carry%
460 fig%(place%) = help% MOD 10
470 carry% = help% DIV 10
480 NEXT
490 NEXT
500 ENDPROC

```

Listing 4

```

10 REM >FastLife (RR4)
20 REM by Andrew Smith
30 REM for Archimedes only
40 REM (c) BAU September 1990
50 :
60 MODE 0
70 OFF
80 VDU 19,0,16,0,0,150
90 DIM code$ 8500, i 8
100 !i=149;i14=-1
110 SYS "OS_ReadVduVariables", i, i
120 scr%=-1
130 FOR opt% = 0 TO 2 STEP 2
140 P% = code%
150 index% = 0; offset% = 1
160 cell% = 3; vote% = 4
170 dummy% = 5
180 zero% = 6; one% = 7
190 base% = 8; scr% = 9
200 byte% = 2
210 x% = 11; y% = 2
220 x1% = 6; y1% = 7
230 gen% = 10
240 DEPT opt%
250 .blank
260 MOV index%, #8192
270 ADR cell, cells
280 ADD vote, cell, index
290 MOV dummy, #0
300 .loop
310 STR dummy, [cell, index]
320 STR dummy, [vote, index]
330 SUBS index, index, #4
340 BPL Loop
350 MOV pc, r14
360 .life
370 STMF D r13!, cr14
380 MOV base, #scr% AND &FFF00000
390 ADD base, base, #scr% AND &FFFF
400 ADR cell, cells
410 ADD vote, cell, #8192
420 MOV gen, #0
430 .mainloop
440 MOV index, #8192
450 SUB index, index, #4
460 MOV x, #63
470 MOV y, #31
480 .loop1
490 LDR dummy, [cell, index]
500 CMP dummy, #1
510 BLEQ votecode
520 SUBS x, x, #1
530 ADDMI x, x, #64
540 SUBMI y, y, #1
550 SUBS index, index, #4
560 BPL Loop1
570 MOV zero, #0
580 MOV one, #1
590 MOV x, #63
600 MOV y, #248
610 MOV index, #8192
620 SUB index, index, #4
630 .loop5
640 LDR dummy, [vote, index]
650 CMP dummy, #0
660 BEQ end

```

```

670 CMP dummy, #4
680 STREQ zero, [vote, index]
690 BEQ end
700 CMP dummy, #3
710 STREQ zero, [vote, index]
720 STREQ one, [cell, index]
730 ADDEQ scr, base, y, LSL #4
740 ADDEQ scr, scr, y, LSL #6
750 ADDEQ scr, scr, x
760 MOVEQ byte, #24
770 STREQ byte, [scr], #80
780 MOVEQ byte, #60
790 STREQ byte, [scr], #80
800 MOVEQ byte, #110
810 STREQB byte, [scr], #80
820 MOVEQ byte, #78
830 STREQB byte, [scr], #80
840 MOVEQ byte, #110
850 STREQB byte, [scr], #80
860 MOVEQ byte, #60
870 STREQB byte, [scr], #80
880 MOVEQ byte, #24
890 STREQB byte, [scr], #80
900 BEQ end
910 STR zero, [vote, index]
920 STR zero, [cell, index]
930 MOV byte, #0
940 ADD scr, base, y, LSL #4
950 ADD scr, scr, y, LSL #6
960 ADD scr, scr, x
970 STRB byte, [scr], #80
980 STRB byte, [scr], #80
990 STRB byte, [scr], #80
1000 STRB byte, [scr], #80
1010 STRB byte, [scr], #80
1020 STRB byte, [scr], #80
1030 STRB byte, [scr], #80
1040 .end
1050 SUBS x, x, #1
1060 ADDMI x, x, #64
1070 SUBMI y, y, #8
1080 SUBS index, index, #4
1090 BPL Loop5
1100 LDR byte, delay
1110 .delayloop
1120 SUBS byte, byte, #1
1130 BPL delayLoop
1140 SWI $119
1150 SWI $446
1160 SWI $119
1170 MOV r0, gen
1180 ADR r1, buffer
1190 MOV r2, #6
1200 SWI "OS_ConvertCardinal2"
1210 SWI "OS_Write0"
1220 ADD gen, gen, #1
1230 MOV r0, #881
1240 MOV r1, #8C8
1250 MOV r2, #8FF
1260 SWI "OS_Byt"
1270 CMP r1, #8FF
1280 BNE off
1290 .pause
1300 MOV r1, #C9
1310 MOV r2, #8FF
1320 SWI "OS_Byt"
1330 CMH r1, #8FF
1340 BNE pause
1350 .off
1360 MOV r1, #8CF
1370 MOV r2, #8FF
1380 SWI "OS_Byt"
1390 CMH r1, #8FF
1400 MOVEQ byte, #10000
1410 STREQ byte, delay
1420 MOV r1, #8CE
1430 MOV r2, #8FF
1440 SWI "OS_Byt"
1450 CMH r1, #8FF
1460 MOVEQ byte, #8000
1470 STREQ byte, delay
1480 MOV r1, #8EE
1490 MOV r2, #8FF
1500 SWI "OS_Byt"
1510 CMP r1, #8FF
1520 MOVEQ byte, #0
1530 STREQ byte, delay
1540 MOV r1, #8EF
1550 MOV r2, #8FF
1560 SWI "OS_Byt"
1570 CMP r1, #8FF
1580 BNE mainloop
1590 LDMFD r13!, {pc}
1600 .delay
1610 EQUD 0
1620 .buffer
1630 EQUD 0
1640 EQUD 0
1650 .votecode
1660 MOV x1, x
1670 MOV y1, y
1680 ADD x1, x1, #1
1690 CMP x1, #64
1700 SUBGE x1, x1, #64
1710 ADD y1, y1, #1
1720 CMP y1, #32
1730 SUBGE y1, y1, #32
1740 MOV offset, y1, LSL #8
1750 ADD offset, offset, x1, LSL #2
1760 LDR dummy, [vote, offset]
1770 ADD dummy, dummy, #1
1780 STR dummy, [vote, offset]
1790 SUBS x1, x1, #1
1800 ADDMI x1, x1, #64
1810 MOV offset, y1, LSL #8
1820 ADD offset, offset, x1, LSL #2
1830 LDR dummy, [vote, offset]
1840 ADD dummy, dummy, #1
1850 STR dummy, [vote, offset]
1860 SUBS y1, y1, #1
1870 ADDMI y1, y1, #64
1880 MOV offset, y1, LSL #8
1890 ADD offset, offset, x1, LSL #2
1900 LDR dummy, [vote, offset]
1910 ADD dummy, dummy, #1
1920 STR dummy, [vote, offset]
1930 SUBS y1, y1, #1
1940 ADDMI y1, y1, #32
1950 ADD x1, x1, #2
1960 CMP x1, #64
1970 SUBGE x1, x1, #64
1980 MOV offset, y1, LSL #8
1990 ADD offset, offset, x1, LSL #2
2000 LDR dummy, [vote, offset]
2010 ADD dummy, dummy, #1
2020 STR dummy, [vote, offset]
2030 SUBS x1, x1, #1
2040 ADDMI x1, x1, #64
2050 MOV offset, y1, LSL #8
2060 ADD offset, offset, x1, LSL #2
2070 LDR dummy, [vote, offset]
2080 ADD dummy, dummy, #1
2090 STR dummy, [vote, offset]
2100 SUBS x1, x1, #1
2110 ADDMI x1, x1, #64
2120 MOV offset, y1, LSL #8
2130 ADD offset, offset, x1, LSL #2
2140 LDR dummy, [vote, offset]
2150 ADD dummy, dummy, #1
2160 STR dummy, [vote, offset]
2170 SUBS y1, y1, #1
2180 ADDMI y1, y1, #32
2190 ADD x1, x1, #2
2200 CMP x1, #64
2210 SUBGE x1, x1, #64
2220 MOV offset, y1, LSL #8
2230 ADD offset, offset, x1, LSL #2
2240 LDR dummy, [vote, offset]
2250 ADD dummy, dummy, #1
2260 STR dummy, [vote, offset]
2270 SUBS x1, x1, #1
2280 ADDMI x1, x1, #64
2290 MOV offset, y1, LSL #8
2300 ADD offset, offset, x1, LSL #2
2310 LDR dummy, [vote, offset]
2320 ADD dummy, dummy, #1
2330 STR dummy, [vote, offset]
2340 SUBS x1, x1, #1
2350 ADDMI x1, x1, #64
2360 MOV offset, y1, LSL #8
2370 ADD offset, offset, x1, LSL #2
2380 LDR dummy, [vote, offset]
2390 ADD dummy, dummy, #1
2400 STR dummy, [vote, offset]
2410 MOV pc, r14
2420 J
2430 cells% = P%
2440 votes% = P% + 8192
2450 NEXT
2460 REPEAT
2470 CLS
2480 CALLblank
2490 PROCredit
2500 VDU 28,64,31,79,0,17,129,17,0,12,2
2510 PRINTTAB(69,3); "LIFE"
2520 PRINTTAB(66,6); "P - Pause"
2530 PRINTTAB(66,8); "O - Resume"
2540 PRINTTAB(66,10); "Q - Quit"
2550 PRINTTAB(66,12); "1 - Slow"
2560 PRINTTAB(66,14); "2 - Medium"
2570 PRINTTAB(66,16); "3 - Fast"
2580 PRINTTAB(67,24); "Generation"
2590 CALL life
2600 PRINTTAB(30,15); "Again? (Y/N)"
2610 REPEAT
2620 c=GET
2630 UNTIL c=89 OR c=78
2640 COLOUR 1:COLOUR 128:CLS
2650 UNTIL c=78
2660 END
2670 :
2680 DEF PROCredit
2690 *POINTER
2700 SYS "OS_Byt", 106, 881
2710 VDU 12,28,64,31,79,0,17,129,17,0,1
2,26
2720 VDU 23,255,24,60,110,78,110,60,24,
0
2730 PRINTTAB(69,3); "LIFE"
2740 PRINTTAB(68,6); "Editing.."
2750 PRINTTAB(65,9); "Use mouse to"
2760 PRINTTAB(65,11); "move cursor."
2770 PRINTTAB(65,13); "Select - Sets"
2780 PRINTTAB(65,15); "Adjust - Clears"
2790 PRINTTAB(65,17); "Menu - Starts"
2800 PRINTTAB(67,20); "R - Random"
2810 PRINTTAB(67,23); " - Blank"
2820 PRINTTAB(67,25); "O - Quit"
2830 MOUSE RECTANGLE 0,0,1022,1020
2840 COLOUR 1:COLOUR 128
2850 REPEAT
2860 MOUSE x%, y%, b%
2870 POINT TO ((x% DIV 16)*16)+8, ((y% DIV
16)*32)+16
2880 IF INKEY=52 THEN
2890 SYS "OS_Byt", 106, 880
2900 COLOUR 0:COLOUR 129
2910 PRINTTAB(65,20); "Return to start"
2920 COLOUR 1:COLOUR 128
2930 REPEAT
2940 WAIT
2950 x% = RND(64)-1: y% = RND(32)-1
2960 !(cells+ (x% DIV 16)*4+(y% DIV 32)*
2970 VDU 31,x%,y%,255
2980 UNTIL INKEY=74
2990 b% = 2
3000 ENDIF
3010 IF INKEY=17 THEN CLS:PRINTTAB(35,1
5); "GOODBYE!!": dummy=GET:END
3020 IF INKEY=83 THEN
3030 CALL blank
3040 VDU 28,0,31,63,0,12
3050 ENDIF
3060 y% = 1023-y%
3070 IF b% = 4 THEN
3080 !(cells+ (x% DIV 16)*4+(y% DIV 32)*
256)=1
3090 VDU 31,x% DIV 16,y% DIV 32,255
3100 ENDIF
3110 IF b% = 1 THEN
3120 !(cells+ (x% DIV 16)*4+(y% DIV 32)*
256)=0
3130 VDU 31,x% DIV 16,y% DIV 32,32
3140 ENDIF
3150 UNTIL b% = 2
3160 SYS "OS_Byt", 106, 880
3170 ENDPROC

```

Additions to
New Modes
program from May
1990 RISC REVUE

```

10 REM Mode Convertor
20 REM Arc only
30 REM (c)BAU Sep 1990
40 :
50 MODE 0:REM or 1 or 2
60 OFF
70 NX-OPENIN"FILENAME"
80 GCOL 16,0
90 FOR Y% = 992 TO 0 STEP -32
100 FOR X% = 0 TO 1279 STEP 16
110 VDU 23,2,BGET#NX,BGET#NX,BGET#NX,BGET#NX
GET#NX,BGET#NX,BGET#NX,BGET#NX,BGET#NX
120 RECTANGLE FILL XX, Y%, 15, 31
130 NEXT X%, Y%
140 CLOSE#NX

```

Listing 1

```

10 REM BBC Goblet
20 REM by Malcolm Dolman and Rob Mill
30 REM for B/B+/E/M/C
40 REM (c) BAU May 1990
50 :
60 MODE 0
70 VDU 19,7,6
80 VDU 23,8202,0,0,0;
90 VDU 29,640,0,0;
100 nshades=12
110 step=(360/(2*nshades))
120 :
130 PROCCylinder(70,220,80,220,1)
140 PROCCylinder(80,220,100,200,1)
150 PROCCylinder(100,200,150,20,1)
160 PROCCylinder(150,30,450,30,1)
170 :
180 FOR R=180 TO 90 STEP -10
190 ew1=SINRAD(R)*250:ew2=SINRAD(R+10)
*250
200 eh1=COSRAD(R)*250:eh2=COSRAD(R+10)
*250
210 PROCCylinder(ew1+700,ew1,eh2+700,e
w2,2)
220 NEXT R
230 :
240 PROCCylinder(700,250,900,225,2)
250 PROCCylinder(900,225,900,215,3)
260 :
270 END
280 :
290 DEF PROCCylinder(ew1,ew2,eh2,ew2,p
al)
300 :
310 RESTORE 630
320 FOR D = -90 TO (270-step) STEP ste
p
330 READ n1,n2,n3,n4,n5,n6,n7,n8
340 IF pal=3 RESTORE 630
350 IF pal=2 AND D<0 THEN 360 ELSE 38
0
360 VDU 23,2,255-n1,255-n2,255-n3,255-
n4,255-n5,255-n6,255-n7,255-n8
370 GOTO 390
380 VDU 23,2,n1,n2,n3,n4,n5,n6,n7,n8
390 GCOL 16,0
400 :
410 h1 = ew1/4:h2 = ew2/4
420 x1 = SINRAD(D)*h1+ew1
430 y1 = (COSRAD(D)*h1)+h1
440 x2 = SINRAD(D+step)*h1+ew1
450 y2 = (COSRAD(D)*h1)+h1
460 x3 = SINRAD(D)*h2+ew2
470 y3 = (COSRAD(D)*h2)+ew2
480 x4 = SINRAD(D+step)*h2+ew2
490 y4 = (COSRAD(D+step)*h2)+ew2
500 :
510 PROQuad(x1,y1,x2,y2,x3,y3,x4,y4)
520 NEXT D
530 :
540 ENDPROC
550 :
560 DEF PROQuad(x1,y1,x2,y2,x3,y3,x4,
y4)
570 MOVE x3,y3
580 MOVE x1,y1
590 PLOT 85,x4,y4
600 PLOT 85,x2,y2
610 ENDPROC
620 :
630 DATA 255,255,255,255,255,255,255,2
55
640 DATA 223,251,127,239,253,191,247,2
54
650 DATA 239,189,247,189,239,189,247,1
89
660 DATA 119,221,119,221,119,221,119,2
21
670 DATA 115,221,155,221,115,221,155,221
680 DATA 174,213,186,87,234,93,171,117
690 DATA 204,51,204,51,204,51,204,51
700 DATA 81,42,69,168,21,162,84,138
710 DATA 140,34,200,34,140,34,200,34
720 DATA 136,34,136,34,136,34,136,34
730 DATA 16,66,8,66,16,66,8,66
740 DATA 16,1,64,4,16,1,64,4
750 DATA 16,66,8,66,16,66,8,66
770 DATA 136,34,136,34,136,34,136,34
780 DATA 140,34,200,34,140,34,200,34
790 DATA 81,42,69,168,21,162,84,138
800 DATA 204,51,204,51,204,51,204,51
810 DATA 174,213,186,87,234,93,171,117
820 DATA 115,221,155,221,115,221,155,221
830 DATA 119,221,119,221,119,221,119,2
21

```

Listing 2

```

840 DATA 239,189,247,189,239,189,247,1
89
850 DATA 223,251,127,239,253,191,247,2
54
860 DATA 255,255,255,255,255,255,255,2
55
700 PROQuad(x1,y1,x2,y2,x3,y3,x4,y4)
710 NEXT D
720 :
730 ENDPROC
740 :
750 DEF PROQuad(x1,y1,x2,y2,x3,y3,x4,
y4)
760 MOVE x3,y3
770 MOVE x1,y1
780 PLOT 85,x4,y4
790 PLOT 85,x2,y2
800 ENDPROC
810 :
820 DATA 136,0,34,0,136,0,34,0
830 DATA 136,34,136,34,136,34,136,34
840 DATA 34,51,136,204,34,51,136,204
850 DATA 204,51,204,51,204,51,204,51
860 DATA 51,119,204,221,51,119,204,221
870 DATA 119,221,119,221,119,221,119,2
21
880 DATA 119,255,221,255,119,255,221,2
55
890 DATA 255,255,255,255,255,255,255,2
55
900 DATA 255,255,255,255,255,255,255,2
55
910 DATA 119,255,221,255,119,255,221,2
55
920 DATA 119,221,119,221,119,221,119,2
21
930 DATA 51,119,204,221,51,119,204,221
940 DATA 204,51,204,51,204,51,204,51
950 DATA 34,51,136,204,34,51,136,204
960 DATA 136,34,136,34,136,34,136,34
970 DATA 136,0,34,0,136,0,34,0
980 DATA 8,0,2,0,8,0,2,0
990 DATA 8,2,8,2,8,2,8,2
1000 DATA 2,3,8,12,2,3,8,12
1010 DATA 12,3,12,3,12,3,12,3
1020 DATA 3,7,12,3,7,12,3,12,3
1030 DATA 7,13,7,13,7,13,7,13
1040 DATA 7,15,13,15,7,15,13,15
1050 DATA 15,15,15,15,15,15,15,15
1060 DATA 15,15,15,15,15,15,15,15
1070 DATA 51,15,15,15,7,15,15,15
1080 DATA 7,13,15,7,13,7,13,7,13
1090 DATA 3,7,12,13,3,7,12,13,7,13
1100 DATA 12,3,12,3,12,3,12,3,12,3
1110 DATA 2,3,8,12,2,3,8,12
1120 DATA 8,2,8,2,8,2,8,2
1130 DATA 8,0,2,0,8,0,2,0
1140 DATA 6,0,16,0,64,0,16,0
1150 DATA 64,16,64,16,64,16,64,16
1160 DATA 64,64,192,16,48,64,192,16
1170 DATA 192,48,192,48,192,48,192,48
1180 DATA 48,112,192,208,48,112,192,208
1190 DATA 112,208,112,208,112,208,112,2
08
1200 DATA 112,240,208,240,112,240,208,2
40
1210 DATA 240,240,240,240,240,240,240,2
40
1220 DATA 240,240,240,240,240,240,240,2
40
1230 DATA 112,240,208,240,112,240,208,2
40
1240 DATA 112,208,112,208,112,208,112,2
08
1250 DATA 48,112,192,208,48,112,192,208
1260 DATA 192,48,192,48,192,48,192,48
1270 DATA 48,64,192,48,64,192,48,192,48
1280 DATA 64,16,64,16,64,16,64,16
1290 DATA 64,0,16,0,64,0,16,0
1300 :
1310 IF M=8 AND pal=2 AND D=-90 THEN RE
STORE 900
1320 IF M=9 AND pal=2 AND D=-90 THEN RE
STORE 1000
1330 IF M=10 AND pal=2 AND D=-90 THEN RE
STORE 1100
1340 IF M=8 AND pal=2 AND D=90 THEN RE
STORE 900
1350 IF M=9 AND pal=2 AND D=90 THEN RE
STORE 1000
1360 IF M=10 AND pal=2 AND D=90 THEN RE
STORE 1100
1370 IF M=8 AND pal=3 THEN RESTORE 890
1380 IF M=9 AND pal=3 THEN RESTORE 1050
1390 IF M=10 AND pal=3 THEN RESTORE 121
0
1400 :
1410 DEF PROCCylinder(ew1,ew1,eh2,ew2,p
al)
1420 :
1430 IF M=8 THEN RESTORE 820
1440 IF M=9 THEN RESTORE 980
1450 IF M=10 THEN RESTORE 1140
1460 FOR D = -90 TO (270-step) STEP ste
p
1470 IF M=8 AND pal=2 AND D=-90 THEN RE
STORE 900
1480 IF M=9 AND pal=2 AND D=-90 THEN RE
STORE 1000
1490 IF M=10 AND pal=2 AND D=-90 THEN RE
STORE 1100
1500 IF M=8 AND pal=2 AND D=90 THEN RE
STORE 900
1510 IF M=9 AND pal=2 AND D=90 THEN RE
STORE 1000
1520 IF M=10 AND pal=2 AND D=90 THEN RE
STORE 1100
1530 IF M=8 AND pal=3 THEN RESTORE 890
1540 IF M=9 AND pal=3 THEN RESTORE 1050
1550 IF M=10 AND pal=3 THEN RESTORE 121
0
1560 READ n1,n2,n3,n4,n5,n6,n7,n8
1570 VDU 23,2,n1,n2,n3,n4,n5,n6,n7,n8
1580 GCOL 16,0
1590 :
1600 h1 = ew1*M/4:h2 = ew2*M/4
1610 x1 = SINRAD(D)*h1+ew1*M/10
1620 y1 = (COSRAD(D)*h1)+ew1*M/10
1630 x2 = SINRAD(D+step)*ew1*M/10
1640 y2 = (COSRAD(D+step)*h1)+ew1*M/10
1650 x3 = SINRAD(D)*ew2*M/10
1660 y3 = (COSRAD(D)*h2)+ew2*M/10
1670 x4 = SINRAD(D+step)*ew2*M/10
1680 y4 = (COSRAD(D+step)*h2)+ew2*M/10
1690 :
1700 STA 872
1710 JSR BFFE3
1720 INX
1730 CPX #6
1740 BNE Loop
1750 JSR BFFE0
1760 STA 872
1770 JMP cat
1780 :
1790 .setuptrap
1800 LDA 820E
1810 STA 820F
1820 LDA #print MOD256
1830 STA 820E
1840 LDA #print DIV 256
1850 STA 820F
1860 RTS
1870 :
1880 .cleartrap
1890 LDA 870
1900 STA 820E
1910 LDA 820F
1920 LDA #printchar
1930 STA 820F
1940 LDA #ASC" "
1950 JMP printchar
1960 :
1970 .printchar
1980 JMP (870)
1990 :
2000 .cat
2010 JSR setuptrap
2020 LDA 872
2030 STA 820E
2040 LDA 820F
2050 STA 820E
2060 LDA #print DIV 256
2070 STA 820F
2080 RTS
2090 :
2100 .catdrive
2110 LDX #catstring MOD 256
2120 LDY #catstring DIV 256
2130 JSR &FFF7
2140 JSR cleartrap
2150 RTS
2160 :
2170 .drive
2180 EQUUS "DRIVE?"
2190 EQUUB 13
2200 :
2210 .catstring
2220 EQUUS "CAT"
2230 :
2240 .catdrive
2250 EQUUB 0
2260 EQUUB 13
2270 J
2280 NEXT
2290 OSCLI("SAVE Passcat "+STR$-900+" "
+STR$-PX+" "+STR$-start)

```

Listing 3

```

10 REM *PSSCAT
20 REM by Mark Lomas
30 REM for B/B+/E/M/C with DFS
40 REM (c) BAU Sep 90
50 :
60 ON ERROR PROCerror
70 MODE 7
80 PROCmenu
90 PROCreadd
100 PROCchange
110 PROCwrite
120 PROCmessage
130 END
140 :
150 DEF PROCmenu
160 CLS
170 PRINT TAB(9)"Disc Pro/unprotector"
180 PRINT TAB(8,1)STRINGS(22,"")
190 INPUT" 1..PROTECT..2..UNPROTECT:
"GS
200 REPEAT
210 INPUT" "ENTER DRIVE: "drive%
220 UNTIL drive%>0 AND drive%<3
230 PRINT" "GO (Y/N)?";
240 GS$=GETS
250 IF GS$>"Y" THEN PROCmenu
260 ENDPROC
270 :
280 DEFPROCread
290 rewr$=853
300 PROCdef
310 PROCcall(ctrl,10)
320 ENDPROC
330 :
340 DEFPROCdef
350 ctrl$=870
360 ctrl$=8200
370 ctrl$=8200
380 ctrl$=253
390 ctrl$=26-rewr%
400 ctrl$=77$0
410 ctrl$=80

```

Listing 4

```

10 REM Disc Protecter/Unprotector
20 REM by Mark Lomas
30 REM for B/B+/E/M/C with DFS
40 REM (c) BAU Sep 90
50 :
60 ON ERROR PROCerror
70 MODE 7
80 PROCmenu
90 PROCreadd
100 PROCchange
110 PROCwrite
120 PROCmessage
130 END
140 :
150 DEF PROCmenu
160 CLS
170 PRINT TAB(9)"Disc Pro/unprotector"
180 PRINT TAB(8,1)STRINGS(22,"")
190 INPUT" 1..PROTECT..2..UNPROTECT:
"GS
200 REPEAT
210 INPUT" "ENTER DRIVE: "drive%
220 UNTIL drive%>0 AND drive%<3
230 PRINT" "GO (Y/N)?";
240 GS$=GETS
250 IF GS$>"Y" THEN PROCmenu
260 ENDPROC
270 :
280 DEFPROCread
290 rewr$=853
300 PROCdef
310 PROCcall(ctrl,10)
320 ENDPROC
330 :
340 DEFPROCdef
350 ctrl$=870
360 ctrl$=8200
370 ctrl$=8200
380 ctrl$=253
390 ctrl$=26-rewr%
400 ctrl$=77$0
410 ctrl$=80

```

EIGHT BITS

◀ Continued

```

420 ctrl?9=&21
430 ENDPROC
440 :
450 DEFPROCwrite
460 rewr%=&4B
470 PROCdef
480 PROCcall(ctrl,10)
490 ENDPROC
500 :
510 DEFPROCcall(C%,end%)

```

```

520 LOCAL AX%,SY%,Y%,RX%
530 AX%=$7F
540 XX=%C
550 Y%=$X%DIV 256
560 REPEAT
570 RX%RX%1
580 CALL &FFE1
590 UNTIL CX%end%=$0 OR RX%=$0
600 IF CX%end%=$0 ENDPROC
610 ENDPROC
620 :
630 DEFPROChange
640 IF GX=1 THEN $B$00=("Secret!"+CHR$0)
650 IF GX=2 $B$00=STRING$(7,CHR$0)
660 ENDPROC
670 :
680 DEFPROCmessage
690 IF GX=2 THEN PRINT!"Code 21 removed"
700 PRINT"drive ";drive%
710 ENDPROC
720 :
730 DEFPROError
740 CLS
750 REPORT:PRINT " at Line ";ERL
760 END

```

RAY TRACING

Listing 1

```

 01 REM Raytracer
 02 REM by Richard Browning
 03 REM B/B+/M/C/E
 04 REM (c) BBC Acorn User September 1990
 50 :
 60 *X,0 OSCLI"TAPE":DX=PA,-8E00:F.IX=PA,TO TOP+4 ST. 4:(IX-DX)=!IX:N.:PA=8E00|H
 70 MODE 2
 80 PROCIA
 90 VDU29,640;512;
100 ja=800
110 ka=3000:la=53:ma=0
120 na=5400:pa=500:pa0=0:qa=6:ra=z+P1
130 PROCsa-(1,0,2):ta=u:va=w:xa=y
140 FOR za=z-300 TO 300 STEP 8
150 FOR a=0z-400 TO 400 STEP 4
160 lab=la:bb=ka:cb=ma:db=0:eb=1
170 fb=x=0
180 PROCsa(za%,_a%,ja-ma)
190 gb=u:hb=w:ia=y
200 jb=FNbka:wa,ya,ka,la,ma,1)
210 IF jb>15 THEN jb=15
220 GCOL0,jb/2:PLT69,za%,_a%
230 NEXT
240 END
250 :
260 DEF FNlb
270 IF mb>=0 THEN =0
280 nb=ABS(-(500-0b)/mb)
290 qb=ABS((pb*nb)+bb):qb=ABS((rb*nb)
cb)
300 IF qb>1E6 OR qb<1E6 THEN =0
310 tb=ob MOD 1279:ub=qb MOD 1023
320 =10+3*(ub\1023)+(3*(ub\512))
330 :
340 DEF FNkb(pb,mb,rb,vb,wb,xb,yb)
350 db=db+1:IF db>6 THEN PRINTTAB(0,0)
;"Iteration Limit!":=0
360 LOCAL zb_,b,ac,bh,ab,cb,cc,dc
370 LOCAL ec,fc,gc,hc,ic,jc,kc,lc,mc,rc
c
380 RESTORE 2140:nc=100000:cc=yb
390 zpbp:=b=mb:ac=rb:bb=vb:ab=wb:cb=x
b:mc=FALSE
400 REPEAT
410 READ oc
420 IF oc=1 THEN IF FNpc THEN mc=TRUE
430 IF oc=2 THEN IF FNqc THEN mc=TRUE
440 UNTIL oc=-1
450 IF NOT mc THEN =FNlb
460 bc=kc
470 IF (lc AND 1) THEN bc=FNrc(kc)
480 IF (lc AND 2) THEN bc=bc+FNsc(kc)
490 IF (lc AND 4) THEN bc=bc+FNtc(kc)
500 IF (lc AND B) THEN bc=bc+FNuc(cc,cc)
c
510 IF (lc AND 16) THEN bc=bc+dc
520 :bc
530 :
540 DEF FNwc(xc,yc,zc)
550 _c=xc*x+yc*y+zc*zc
560 IF _c<0 THEN bd=TRUE ELSE bd=FALSE
E
570 cd=xc*zb+yc*_b+zc*ac
580 IF (NOT bd) THEN IF cd<0 THEN GOTO 630
590 dd=ad+-c+cd*cd
600 IF dd<=0 THEN GOTO 630
610 IF bd THEN ed=cd+SQR(dd) ELSE ed=d-SQR(dd)
620 :TRUE
630 :FALSE
640 :
650 DEF FNpc
660 READ fd,gd,hd,ld,dc,jd
670 IF (jd AND 8)=8 THEN READ vc
680 ad=id*id
690 IF NOT (FNwc(fd-bb,gd-ab,hd-cb)) THEN =FALSE
700 IF ednc THEN =FALSE
710 IF bd AND (jd AND 8)=8 THEN vc=1
720 nc=dc:kc=bc:lc=z'
```

730 hc=bb+b*kd:ic=ab+**b***ed:jc=cb+ack*
 740 PROCsa(hc-fd,ic-gd,jc-hd)
 750 ec=ua:=uc:fa:=gc:=ya
 760 If (jd AND 16) THEN dc=dc+FNkd(1,e
 fc,gc)
 770 =TRUE
 780 :
 790 DEF FNqc
 800 READ ld,md,nd,od,bc,jd
 810 IF (jd AND 48) THEN READ pd,qd,rd,
 d,td,ud,wd,xd,yd,zd,_d
 820 IF NOT(FNae(ld,md,nd,od)) THEN =FA
 SE
 830 IF ed>nc THEN =FALSE
 840 be=ab+**b***kd:IF ABS(be)>500 THEN =F
 LSE
 850 kc=bc:lc=jd
 860 hc=bb+b*kd:ic=be:jc=cb+ack*ed
 870 If c>0 THEN ld=ld:md=md:nd=nd
 880 PROCsa(lld,md,nd)
 890 ec=ua:=uc:fa:=gc:=ya
 900 If (jd AND 48) THEN nd=FNkd(2,hc,i
 ,jc)
 910 If nd<0 THEN =FALSE ELSE dc=nd
 920 nc=ed
 930 =TRUE
 940 :
 950 DEF FNae(lld,md,nd,od)
 960 ce=FNde(lld,md,nd,zb,_b,ac)
 970 If ce=0 THEN =FALSE
 980 ee=:=FNde(lld,md,nd,bb,ab,cb)+od
 990 ed=ee+od
 1000 If ed<0 THEN =FALSE
 1010 =TRUE
 1020 :
 1030 DEF FNrc(fe)
 1040 PROCsa(na-hc,oa-ic,pa-jc)
 1050 ge=FNe(ua,wa,ya,ec,fc,gc)
 1060 If ge<0 THEN =0
 1070 he=fe+qa*0.5*ge
 1080 =he
 1090 :
 1100 DEF FNsc(ie)
 1110 je=hc-na:=ke=ic-
 oa:le=jc-
 pa
 1120 PROCsa(je,ke,le)
 1130 PROCMec(fc,fc,gc,gb,_b,ac)
 1140 ne=FNe(de,pe,qa,ec,fc,gc)
 1150 re=FNe(de,pe,qa,-zb,_b,-ac)
 1160 If re<0 THEN =0
 1170 se=SQR(je+jt*ke+le*le)
 1180 te=+t*ABS(6000/(set+20))*(0.5*net+2*
 (re*60))
 1190 =te
 1200 :
 1210 DEF FNtc(kc)
 1220 PROCMec(fc,fc,gc,gb,_b,ac)
 1230 hb=pe:gb=oe:ib=qe
 1240 =FNkb(oe,pe,qa,hctec,ic+fc,jc+gc,c
 c)
 1250 :
 1260 DEF FNuc(ue,ue)
 1270 fbw=1
 1280 If bd THEN ge=FNe(zb,_b,ac,ec,fc,
 gc) ELSE ge=FNe(-zb,-b,-ac,ec,fc,gc)
 1290 ve=eb/ue
 1300 we=(1+((ve*ke)*((ge*ge)-1)))
 1310 If we<0 THEN =0
 1320 xe=(ve*ge)-SQR(we)
 1330 ye=ve*zb+xe*ec:ze=ve*
 b+xe*fc:_e=
 e*ack+xe*gc
 1340 PROCsa(ye,ze,_e)
 1350 =FNkb(ua,wa,ya,hctua,ict+wa,jc+ya,u
 ,e)
 1360 :
 1370 DEF FNek(ed,ub,ub,af)
 1380 If ed=1 THEN =FNb(ub,ub,af)
 1390 If ed>2 THEN =FNcf(ub,ub,af)
 1400 =0
 1410 :
 1420 DEF FNfb(ub,ub,af)
 1430 df=AC(FNde(-tb,-ub,-af,0,1,0))
 1440 we=df/Pi

1450 IF we=1 OR we=0 THEN ed=0:GOTO 150
 0
 1460 ff=FNde(ta,va,xa,tb,ub,af)/SINdf:1
 F ff<-1 THEN ff=-1 ELSE If ff>1 THEN ff=1
 1470 ne=Acs(ffc)/ra
 1480 PROGcf(0,1,0,ta,va,xa)
 1490 If FNde(hf,if,jf,tf,ub,af)>0 THEN
 ef=ne ELSE ef=1-ne
 1500 =FNfk(ef,we)
 1510 :
 1520 DEF FNcf(tb,ub,af)
 1530 Lf=sd+vd-yd:mf=qd+td+wd-zd:nf=r
 d-ud+xd-xd
 1540 of=sd-pd:pf=t+d-qd:fr=qd-rd
 1550 rf=dy-pd:af=zd-tf=d-rd
 1560 up=fd:pf=qd:wf=r
 1570 PROGcf(lf,mf,nf,ec,fc,gc):xf=hf:yf
 =if:zf=jf
 1580 PROGcf(rf,rf,tf,ec,fc,gc):f_h=ag
 =if:bg=jf
 1590 cq=FNde(f,ag,bg,uf,vf,wf)
 1600 dg=FNde(xf,yf,zf,ub,vf,wf)+FNde(_f
 ,ag,bg,of,pf,qf)
 1610 eg=FNde(xf,yf,zf,of,pf,qf)
 1620 If eg<0 THEN GOTO 1660
 1630 fg=2*eg:gg=xf/f:hg=zf/f:ig=zf/gf
 1640 jq=fg:kg=cg:eg=lg:=f:reg:mg=a
 g/eg:ng=bg/eg
 1650 GOTO 1680
 1660 ef=(FNde(f,ag,bg,tb,ub,af)-cg)/(d
 g-FNde(xf,yf,zf,tb,ub,af))
 1670 If ef>0 AND ef<1 THEN GOTO 1720
 ELSE =-1
 1680 og+jg=FNde(gg,hg,ig,tb,ub,af):pg=k
 g/FNde(lg,mg,ng,tb,ub,af)
 1690 qg=og+kg-pg:If qg<0 THEN =-1
 1700 qg=SQR(qg):ef=og-qq:If ef>0 AND ef<
 =1 THEN GOTO 1720
 1710 ef=og+qg:If ef<0 OR ef>1 THEN =-1
 1720 PROGcf(of,pf,qf,ef,fc,gc):rg=hf:sg
 =if:tg=jf
 1730 ug=FNde(rg,sg,tg,uf,vf,wf)
 1740 fd=FNde(xf,yf,zf,uf,vf,wf)+FNde(rg
 ,sg,tg,fr,sf,tf)
 1750 wg=FNde(xf,yf,zf,rf,sf,tf)
 1760 If ug<0 THEN GOTO 1800
 1770 xg=2*wg:yg=xf/yf:zg=zf/xg:
 1780 ah=vg:vg:bu=wg/wg:ch=-rg/wg:dh=-s
 g/wg:hg=-tg/wg
 1790 GOTO 1820
 1800 we=(FNde(rg,sg,tg,ub,af)-ug)/(v
 g-FNde(xf,yf,zf,ub,af))
 1810 If we=0 AND we<1 THEN GOTO 1860
 ELSE =-1
 1820 og=ah+FNe(yg,zg,_g,tb,ub,af):pg=b
 hf=FNde(ch,db,eh,th,ub,af)
 1830 qg=og+kg-pg:If qg<0 THEN =-1
 1840 qg=SQR(qg):we=og-qq:If we>0 AND we<
 =1 THEN GOTO 1860
 1850 we=og+qg:If we<0 OR we>1 THEN =-1
 1860 =FNfk(ef,we)
 1870 :
 1880 DEF PROGcf(pb,mb,rb,vb,wb,xb)
 1890 hf=(mb*xb-rb*xb):if=(rb*vb-xb*pb):
 jf=(pb*xb-ub*xb):
 1900 ENDPROC
 1910 DEF FNf(gh,gh,hh,jh,kh)
 1920 =fh=kh*gh*kh+jh*hh*kh
 1930 DEPRFCOMe(lh,mh,nh,oh,ph,qh)
 1940 ge=FNde(lh,mh,nh,oh,ph,qh)
 1950 PROCsa(oh-2*ge*lh,ph-2*ge*mh,qh-2*
 getnh)
 1960 oe=ua:pe=wa:qe=ya
 1970 ENDPROC
 1980 :
 1990 DEF PROCs(a(rh,sh,th)
 2000 uh=SQR(rh*rh+sh*sh+th*th)
 2010 ua=rh/uh:wa=sh/uh:ya=th/uh
 2020 ENDPROC
 2030 :
 2040 DEF FNfk(ef,we)

2050 UX=1279-ef*1279:VX=1023-we*1023
 2060 =15*SIINRADUX+15*COSRADV
 2070 :
 2080 DEF PROCia
 2090 FOR Lz=0 TO 7
 2100 READ C%:VDU19,LX,CX;0;0;;
 2110 NEXT
 2120 DATA 0,4,1,5,2,6,3,7
 2130 ENDPROC
 2140 DATA 2,0,1,0,200,0,48,2800,-200,200
 0,2400,-200,0,3400,-200,0,3200,-200,200
 0
 2150 DATA 1,3000,200,800,200,0,6
 2160 DATA -1,0,0,0,0,0,0

Listing 2

10 REM >RayTrace
 20 REM by Richard Browning
 30 REM for Arc only
 40 REM (c) BBC Acorn User September 1
 990
 50 :
 60 MODE 12
 70 PROCsetpalette
 80 :
 90 REM ** The following is an example
 of loading a sprite for texture mapping
 100 REM ** Don't forget to specify the
 correct filename and also set
 110 REM ** SCREENSIZE to 1600 at least
 120 REM SYS "OS_Byte",112,1
 130 REM *SCREENLOAD PICS,MPIC
 140 REM SYS "OS_Byt",112,1
 150 :
 160 VDU29,640;512;
 170 REM ** Screen position
 180 :
 190 Screen_z=800
 200 REM ** Viewer position
 210 :
 220 px=3500:py=30:pz=-200
 230 REM ** Light position
 240 :
 250 Lightx=3400:Lighty=500:Lightz=0:L
 ht=6:TPI=2KPI
 260 REM ** Rotational parameters for
 sphere texture mapping
 270 :
 280 PROChormalise(-1,0,2):Sex=Rd_x:Se
 =Rd_y:Sez=Rd_z
 290 :
 300 FOR x=-600 TO 600 STEP 2
 310 FOR y=-400 TO 400 STEP 4
 320 :
 330 REM ** Initialise ray origin
 340 posy=py:posx=px:posz=pz:it=Si=1
 350 :
 360 REM ** Normalise ray vector
 370 PROChormalise(X,y,z,Screen_z-pz)
 380 rx=Rd_x:ry=Rd_y:rz=Rd_z
 390 :
 400 REM ** Call the tracer
 410 pixel=NTracer(Rd_x,Rd_y,Rd_z,pX,pY
 ,pz,1)
 420 :
 430 IF pixel>15 THEN pixel=15
 440 GCOLD,pixel:POINT X%,Y%
 450 :
 460 NEXT,
 470 NEXT
 480 END
 490 :
 500 REM ** The ol' tartan floor
 510 :
 520 DEF FNfloor
 530 If y>0 THEN =0
 540 ratio=ABS((-500-posy)/y)
 550 xpos=ABS((x*1/ratio)+posx):zpos=AB
 ((x*1/ratio)+posz)
 560 If x>posx THEN =E6 OR zpos>1E6 THEN =0

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◀ Continued

```

570 x=xpos MOD 1279:y=zpos MOD 1023
580 =+3*(x<640)+2*(y<512)
590 :
600 DEF FNtrace(x1,y1,z1,x2,y2,z2,ir)
610 ir+=1:IF ir>6 THEN PRINTTAB(0,0);"Iteration Limit!!":=0
620 LOCAL cray_x,cray_y,cray_z,posx,po
sy,posz,col,ind_refrac,ctex
630 LOCAL xnv,ynv,znv,xhit,yhit,zhit,h
itcol,surface,hit,intersec_dist
640 RESTORE 3270:intersec_dist=100000:
ind_refrac=ir
650 cray_x=x1:cray_y=y1:cray_z=z1:posx
=x2:posy=y2:posz=z2:hit=FALSE
660 :
670 REM ** Check for object intersecti
on
680 REPEAT
690 READ type
700 IF type=1 THEN IF FNsphere THEN hi
t=TRUE
710 IF type=2 THEN IF FNplane THEN hit
=TRUE
720 UNTIL type=-1
730 IF NOT hit THEN =FNfloor
740 :
750 REM ** Ray hit object, so call oth
er routines depending on
760 REM ** <SURFACE> parameter
770 col=hitcol
780 REM ** Matt
790 IF (surface AND 1) THEN col=FNdiff
(hitcol)+RND(1)-0.5
800 REM ** Shiny
810 IF (surface AND 2) THEN col=col+FN
spec(hitcol)+RND(1)-0.5
820 REM ** Mirror
830 IF (surface AND 4) THEN col=col+FN
mirror(hitcol)
840 REM ** Opaque
850 IF (surface AND 8) THEN col=col+FN
opaque(ind_refrac,ir)
860 REM ** Texture-Mapped
870 IF (surface AND 16) THEN col=col+c
tex
880 =col
890 :
900 DEF FNhit_sphere(0C_x,0C_y,0C_z)
910 REM ** Find the ray to the centre
and its length squared
920 L2oc=0C_x*0C_x+0C_y*0C_y+0C_z*0C_z
930 REM ** If inside sphere then recor
d that fact
940 IF L2oc<Sr2 THEN inside_sphere=TRU
E ELSE inside_sphere=FALSE
950 REM ** Now calculate closest appro
ach
960 Tca=0C_x*cray_x+0C_y*cray_y+0C_z*c
ray_z
970 REM ** Test if pointing away from
sphere centre
980 IF NOT(inside_sphere) THEN IF Tca
<0 THEN GOTO 1060
990 REM ** Calculate half-chord distan
ce
1000 T2hc=Sr2-L2oc*Tca*Tca
1010 REM ** If ray misses sphere then c
ontinue with loop
1020 IF T2hc<0 THEN GOTO 1060
1030 REM ** Intersection distance
1040 IF inside_sphere THEN t=Tca+SQR(T2
hc) ELSE t=Tca-SQR(T2hc)
1050 =TRUE
1060 =FALSE
1070 :
1080 DEF FNsphere
1090 READ Sphere_x,Sphere_y,Sphere_z,cr
y,stype
1100 IF (stype AND 8)=8 THEN READ rir
1110 Sr2=Sr*Sr
1120 REM ** Does ray hit the sphere?
1130 IF NOT(FNhit_sphere(Sphere_x-posx,
Sphere_y-posy,Sphere_z-posz)) THEN =FALS
E
1140 REM ** And is it nearest to ray or
igin?
1150 IF t>intersec_dist THEN =FALSE
1160 REM If leaving sphere then ind. re
fr. =1
1170 IF inside_sphere AND (stype AND 8)
=8 THEN rir=1
1180 REM ** Continue and save distance
for future comparison along with
1190 REM ** any other attributes which
may need to be added later,
1200 REM ** e.g. surface type (diffract
, reflect) etc
1210 REM ** and reflection/refraction v
ectors
1220 REM ** For all these, use GLOBAL v
ariables for accessibility
1230 intersec_dist=t:hitcol=col:surface
=stype
1240 xhit=posx+cray_x*t:yhit=posy+cray_
y*t:zhit=posz+cray_z*t
1250 PROCnormalise(xhit-Sphere_x,yhit-S
phere_y,zhit-Sphere_z)
1260 xnv=Rd_x:ynv=Rd_y:znv=Rd_z
1270 IF (stype AND 16) THEN ctex=FNmap
(1,xnv,ynv,znv)
1280 =TRUE
1290 :
1300 FNplane
1310 READ A,B,C,D,col,stype
1320 IF (stype AND 48) THEN READ P00x,P
00y,P00z,P10x,P10y,P10z,P11x,P11y,P11z,P
01x,P01y,P01z
1330 REM ** Does ray hit the plane?
1340 IF NOT(FNhit_plane(A,B,C,D)) THEN
=FALSE
1350 REM ** And is it nearest to ray or
igin?
1360 IF t>intersec_dist THEN =FALSE
1370 yint=poz+cray_z*t:if ABS(yint)>50
0 THEN =FALSE
1380 hitcol=col:surface=stype
1390 xhit=poz+cray_x*t:yhit=yint:zhit=
poz+cray_z*t
1400 IF vd>0 THEN A=-B=B-C=0
1410 PROCnormalise(A,B,C)
1420 xnv=Rd_x:ynv=Rd_y:znv=Rd_z:c=0
1430 IF (stype AND 48) THEN c=FNmap(2,
xhit,yhit,zhit)
1440 IF (stype AND 48) AND c<0 THEN =FA
LSE ELSE ctex=ctex+c
1450 intersec_dist=
1460 =TRUE
1470 :
1480 DEF FNhit_plane(A,B,C,D)
1490 vd=FNdot(A,B,C,cray_x,cray_y,cray_
z)
1500 REM ** Just where is ray/normal po
inting?
1510 IF vd=0 THEN =FALSE
1520 vd=(FNdot(A,B,C,poz,poxy,poz)+0
)
1530 t=v0/vd
1540 IF t<0 THEN =FALSE
1550 =TRUE
1560 :
1570 REM ** Used only outside program s
equence
1580 :
1590 DEF PROGgetcoeffs(x1,y1,z1,x2,y2,z
2,x3,y3,z3,x,y,z)
1600 A=.5*(z1+z2)*(y2-y1)+(z2+z3)*(y3-
y2)+(z3+z1)*(y1-y3)
1610 B=.5*(z1+z2)*(x2-x1)+(z2+z3)*(x3-
x2)+(z3+z1)*(x1-x3)
1620 C=.5*(y1+y2)*(x2-x1)+(y2+y3)*(x3-
x2)+(y3+y1)*(x1-x3)
1630 D=-(A*x+B*y+C*z)
1640 ENDPROC
1650 :
1660 REM ** Controls the diffuse reflec
tion of light
1670 :
1680 DEF FNdiff(Ccol)
1690 PROCnormalise(lightx-xhit,lighty-y
hit,lightz-zhit)
1700 angle=FNdot(Rd_x,Rd_y,Rd_z,xnv,ynv
,znv)
1710 IF angle<0 THEN =0
1720 colour=Ccol+lighti*0.5*angle
1730 =colour
1740 :
1750 REM ** Controls the specular refle
ction of light
1760 :
1770 DEF FNspec(Scol)
1780 lx=xhit-lightx:ly=yhit-lighty:lz=
light-lightz
1790 PROCnormalise(lx,ly,lz)
1800 PROCnormalise(xnv,ynv,znv,Rd_x,Rd_y,Rd_
z)
1810 theta=FNdot(refl_x,refl_y,refl_z,x
nv,ynv,znv)
1820 (lambda=FNdot(refl_x,refl_y,refl_z,
-crav_x,-cray_y,-cray_z)
1830 IF lambda<0 THEN =0
1840 l=SQR(lx*lx+ly*ly+lz*lz)
1850 c=Scol+ABS(6000/(l+20))*(0.5*theta
+2*(lambda<0))
1860 =c
1870 :
1880 REM ** Mirrored object
1890 :
1900 DEF FNmirror(hitcol)
1910 PROCrefl(xnv,ynv,znv,cray_x,cray_y
,cray_z)
1920 ry=refl_y:rx=refl_x:rz=refl_z
1930 =FNtrace(refl_x,refl_y,refl_z,xhit
+xnv,yhit+ynv,zhit+znv,ind_refrac)
1940 :
1950 REM ** Opacity (refraction)
1960 :
1970 DEF FNopaque(Si,St)
1980 IF inside_sphere THEN angle=FNdot(
cray_x,cray_y,cray_z,xnv,ynv,znv) ELSE a
ngle=FNdot(-cray_x,-cray_y,-cray_z,xnv,y
nv,znv)
1990 Nit=Si/St
2000 v=(1+(Nit*Nit)*(angle*angle)-1))
)
2010 REM ** Total internal reflection =
(<v>)
2020 IF v<0 THEN =0
2030 coeff=(Nit*angle)-SORV)
2040 Tx=Nit*cray_x+c coeff*xnv:Ty=Nit*cr
ay_y+c coeff*ynv:Tz=Nit*cray_z+c coeff*zn
v
2050 PROCnormalise(Tx,Ty,Tz)
2060 =FNtrace(Rd_x,y,Rd_z,xhit+Rd_x,
yhit+ry,zhit+Rd_z,St)
2070 :
2080 REM ** Texture-mapping
2090 :
2100 DEF FNmap(t,x,y,z)
2110 IF t=1 THEN =FNmap(x,y,z)
2120 IF t=2 THEN =FNmap(x,y,z)
2130 =0
2140 :
2150 REM ** Sphere texture mapping
2160 :
2170 DEF FNmap(x,y,z)
2180 phi=FNmap(x,-y,-z,0,1,0))
2190 vphi=PI
2200 IF v=1 OR v=0 THEN u=0:GOTO 2250
2210 =FNdot(Sex,Sez,Sez,x,y,z)/SINphi:
IF T<-1 THEN u=T-1 ELSE IF T>1 THEN T=1
2220 theta=ACST(T)/TP1
2230 PROCxprod(0,1,0,Sex,Sez,Sez)
2240 IF FNdot(xz,xy,xz,yz)>0 THEN u=
theta ELSE u=1-theta
2250 =FNgtex(U,V)
2260 :
2270 REM ** Polygon texture-mapping and
bound test
2280 :
2290 DEF FNmap(x,y,z)
2300 Pax=P00x+P10x+P11x-Pay=P00y-P
10y+P11y-P01y:Pxz=P00z+P10z+P11z-P
01z-P00z
2320 Pcx=P01x-P00x:pcy=P01y-P00y:pcz=P0
1z-P00z
2330 Pdx=P00x:pdy=P00y:pdz=P00z
2340 PROCxprod(Pax,Pay,Paz,xnv,ynv,znv)
:Nxx=xx:Nxy=Nay:Nxz=Naz
2350 PROCxprod(Pcx,Pcy,Pcz,xnv,ynv,znv)
:Ncx=xx:Ncy=Nay:Ncz=Naz
2360 Du0=FNdot(Ncx,Ncy,Ncz,Pdx,Pdy,Pdz)
2370 Du1=FNdot(Nax,Nay,Naz,Pdx,Pdy,Pdz)
+FNdot(Ncx,Ncy,Ncz,Pbx,Pby,Pbz)
2380 Du2=FNdot(Nax,Nay,Naz,Pbx,Pby,Pbz)
2390 IF Du2=0 THEN GOTO 2430
2400 Du2=2*Du2:Quxx=Nax/Du2:Quxy=Nay/
Du2:Quzx=Nay/Du2
2410 Du2=Du1/Du2:Du2=Du0/Du2:Quy=-N
x/Du2:Quy=-Ncy/Du2:Quy=-Ncz/Du2
2420 GOTO 2450
2430 u=(FNdot(Nax,Nay,Naz,x,y,z)-Du0)/(
Du1-FNdot(Nax,Nay,Naz,x,y,z))
2440 IF u>0 AND u<1 THEN GOTO 2490 EL
SE=-1
2450 Ka=Dux+FNdot(Quxx,Quyy,Quzx,x,y,z)
:Kb=Duy+FNdot(Quyy,Quzz,Qux,y,x,y,z)
:Nbx=xx:Nby=Nyy:Nbz=xz
2500 Du0=FNdot(Nbx,Nby,Nbz,Pdx,Pdy,Pdz)
2510 Du1=FNdot(Nax,Nay,Naz,Pdx,Pdy,Pdz)
+FNdot(Nbx,Nby,Nbz,Pcx,Pcy,Pcz)
2520 Du2=FNdot(Nax,Nay,Naz,Pcx,Pcy,Pcz)
2530 IF Du2=0 THEN GOTO 2570
2540 Du2=2*Du2:Quxx=Nax/Du2:Quyy=Nay/
Du2:Quzx=Nay/Du2
2550 Du2=Du1/Du2:Du2=Du0/Du2:Quy=-N
x/Du2:Quy=-Nby/Du2:Quy=-Nbz/Du2
2560 GOTO 2610
2570 l=(Du1-FNdot(Nax,Nay,Naz,x,y,z))
2580 IF l=0 THEN =1
2590 v=(FNdot(Nbx,Nby,Nbz,x,y,z)-Du0)/l
2600 IF v>0 AND v<1 THEN GOTO 2650 EL
SE=-1
2610 Ka=Dvx+FNdot(Quxx,Quyy,Quzx,x,y,z)
:Kb=Dvy+FNdot(Quyy,Quzz,Qux,y,x,y,z)
2620 rt=Ka+Kb:IF rt<0 THEN =-1
2630 rt=SQR(rt):v=Ka-rt:IF v>0 AND v<1
THEN GOTO 2650
2640 v=Ka+rt:IF v<0 OR v>1 THEN =-1
2650 =FNgtex(u,v)
2660 :
2670 REM ** Cross product
2680 :
2690 DEF PROCxprod(x1,y1,z1,x2,y2,z2)
2700 xx=(y1*x2-z1*y2):xy=(z1*x2-z2*x1):
xz=(x1*y2-z1*y2)
2710 ENDPROC
2720 :
2730 REM ** Dot product
2740 :
2750 DEF FNdot(p1,q1,r1,p2,q2,r2)
2760 REM ** Vector signs calculated as
<dest>-<source>
2770 =p1*p2+q1*q2+r1*r2
2780 :
2790 REM ** Calculate reflection vector
2800 :
2810 DEF PROCrefl(xn,yn,zn,cx,cy,cz)
2820 angle=FNdot(xn,yn,zn,cx,cy,cz)
2830 PROCnormalise(cx-2*angle*xn,cy-2*angle
*yn,cz-2*angle*zn)
2840 refl_x=Rd_x:refl_y=Rd_y:refl_z=Rd_
z
2850 ENDPROC
2860 :
2870 REM ** Normalise vector
2880 :
2890 DEF PROCnormalise(dv_x,dv_y,dv_z)
2900 dvu=SQR(dv_x*dv_x+dv_y*dv_y+dv_z*d
v_z)
2910 Rd_x=dv_x/dvu:Rd_y=dv_y/dvu:Rd_z=d
v_z/dvu
2920 ENDPROC
2930 :
2940 REM ** Insert here either the math
function or sprite mapping
2950 REM ** 0 <= u <= 1 and 0 <= v <=
1 always
2960 :
2970 DEF FNgtex(u,v)
2980 UX=1279-UX1279:V=1023-V*1023
2990 REM ** This example reads a sprite
map
3000 REM SYS"OS_Byt",112,2
3010 REM p=POINT(U%-640,512-V%)
3020 REM SYS"OS_Byt",112,1
3030 REM ** Or instead use a maths func
tion
3040 =(10*COSRADU%)+(5*SINRADU%)
3050 :
3060 REM ** Set mono palette
3070 :
3080 DEF PROCsetpalette
3090 FOR L%=-1 TO 15
3100 COLOURL%,L%<<4,L%<<4,L%<<4
3110 NEXT
3120 ENDPROC
3130 :
3140 REM ** Scene data in form of:
3150 <OBJ_TYPE>,[<arg1>],[<arg2>],.
..,[<arg3>],<colour>,<SURFACE>,[..,args..]
3160 REM ** Where <OBJ_TYPE>=1 => SPHER
E
3170 REM ** <OBJ_TYPE>=2 => PLANE
3180 REM ** <SURFACE>=1 => Matt
3190 REM ** <SURFACE>=2 => Shiny
3200 REM ** <SURFACE>=4 => Mirror
3210 REM ** <SURFACE>=8 => Opaque
3220 REM ** <SURFACE>=16 => Textu
re-Mapped
3230 REM ** <SURFACE>=32 => quadl
iteral-mapped
3240 :
3250 REM ** Plane at y=-100, texture-ma
pped and mirrored
3260 :
3270 DATA 2,0,1,0,100,2,52
3280 :
3290 REM ** Plane vertices (because <SU
RFACE> AND 32 = 32)
3300 :
3310 DATA 4000,-100,1500,4000,-100,200,
3000,-100,200,3000,-100,1500
3320 :
3330 REM ** Sphere at (3500,100,700), r
adius 200, texture-mapped with spec. ref
3340 :
3350 DATA 1,3500,100,700,200,1,18
3360 :
3370 REM ** No more
3380 DATA -1,0,0,0,0,0

```

◀ Continued

STRETCH

Listing 1

```

10 REM >!RunImage
20 REM Draw File Stretcher
30 REM by Chris Ruseman
40 REM for Archimedes only
50 REM (c) BAU September 1990
60 :
70 DIM q% 8500,buffer% 8100,iconinf% 8200,menubuf% 8400,ic% 8100,q2% 8500
80 PROCinithelp
90 $q%="TASK"
100 SYS "Wimp_Initialise",200,!q%,"Str
etch" TO version%,mytask%
110 PROCinitwindows
120 PROCinitflags
130 PROCmakemenus
140 stretchicon=FNiconbar
150 ON ERROR PROCerrorbox
160 PROCinitdraw
170 PROCsetextents
180 REPEAT
190 SYS "Wimp_Poll",0,q% TO reason%
200 CASE reason% OF
210 WHEN 0:PROCNULL
220 WHEN 1:PROCredraw(q%)
230 WHEN 2:SYS "Wimp_OpenWindow",,q%
240 WHEN 3:PROCclosewindow(!q%)
250 WHEN 6:PROCcheckmouse(!q%,q%14,q%!
8,q%12,q%16,q%20)
260 WHEN 7:PROCdrag
270 WHEN 8:PROCkey(!q%,q%14,q%18,q%12
,q%16,q%20,q%24)
280 WHEN 9:PROCmenuselect(q%)
290 WHEN 17,18:PROCmessage
300 END CASE
310 UNTIL FALSE
320 END
330 :
340 DEF PROCNULL
350 LOCAL newx%,newy%,bx%
360 IF corner%>0 THEN
370 MOUSE newx%,newy%,bx%
380 IF newy%>dragx% OR newy%<dragx%
THEN
390 PROCalter(newx%,newy%,contup%)
400 dragx%=newx%
410 dragy%=newy%
420 ENDIF
430 IF (bx% AND 5)=0 THEN
440 PROCalter(newx%,newy%,TRUE)
450 corner%=0
460 PROCforcedraw(mainhand%)
470 ENDIF
480 ENDIF
490 ENDPROC
500 :
510 DEF PROCdrag
520 dragging%!=FALSE
530 SYS "Wimp_GetPointerInfo",,q%
540 q%132=q%14
550 q%128=q%
560 q%124=q%16
570 q%120=q%12
580 q%16=1
590 q%12=0
600 q%136=ext(curobj%)
610 q%140=8AFF
620 $q%44=FNlastbit(FNgetstr(savet
xt)+CHR$(0)
630 !q%>0
640 SYS "Wimp_SendMessage",17,q%,q%12
650 transptr=0
660 ENDPROC
670 :
680 DEF FNgetstr(a%)
690 LOCAL bs%
700 WHILE INSTR(s$,"")>0
710 bs$=MIDS($$,INSTR(s$,"")+1)
720 a$+=1
730 ENDWHILE
740 :b
750 :
760 DEF FNlastbit(s$)
770 WHILE INSTR(s$,"")>0
780 ss=MIDS($$,INSTR(s$,"")+1)
790 ENDWHILE
800 WHILE INSTR(s$,"")>0
810 ss=MIDS($$,INSTR(s$,"")+1)
820 ENDWHILE
830 ==s
840 :
850 DEF PROCkey(hand%,icon%,xcar%,ycar
%,carh%,carpos%,key%)
860 CASE hand% OF
870 WHEN savehand%:
880 IF key%>13 PROCsave(FNgetstr(savet
ext));PROCclosemenu
890 WHEN zoomhand%:
900 IF key%>13 THEN
910 PROCtextend(zoomhand%,(icon%+1) MO
D 2)
920 IF icon%>1 THEN
930 zoom1%=VAL($FNtextaddr(zoomhand%,
0))
940 zoom2%=VAL($FNtextaddr(zoomhand%,
1))
950 PROChangezoom
960 ENDIF
970 ENDIF
980 ENDCASE
990 ENDPROC
1000 :
1010 DEF FNtextaddr(hand%,icon%)
1020 PROGgeticoninfo(hand%,icon%)
1030 =iconinfo%128
1040 :
1050 DEF PROCgeticoninfo(hand%,icon%)
1060 !iconinfo%hand%
1070 iconinfo%14=icon%
1080 SYS "Wimp_GetIconState",,iconinfo%
1090 ENDPROC
1100 :
1110 DEF PROCredraw(q%)
1120 LOCAL object%
1130 SYS "Wimp_RedrawWindow",,q% TO mor
e%
1140 WHILE more%
1150 PROExtract(q%)
1160 IF !q%>mainhand% THEN
1170 IF !loaded>0 THEN
1180 FOR object%>0 TO maxf%-1
1190 IF block(object%)->-1 PROCdraw(bloc
k2(object%),ax0%+offx%(object%)*zoom1%/
zoom2%,ay0%+offy%(object%)*pagesize%)*zo
om1%*zoom2%,object%,corner%)
1200 NEXT
1210 ENDIF
1220 ENDIF
1230 SYS "Wimp_GetRectangle",,q% TO mor
e%
1240 ENDWHILE
1250 ENDPROC
1260 :
1270 DEF PROCmessage
1280 LOCAL taskx%,ref%
1290 task%=q%14
1300 ref%>q%18
1310 CASE q%16 OF
1320 WHEN 0:PROCshutdownwimp
1330 WHEN 1:
1340 IF task%>mytask% THEN
1350 PROCallthemoff("You can't do that
!")
1360 ELSE
1370 tempbufsize%>q%136
1380 IF tempbufsize%>1 tempbufsize%>10
24
1390 PROFreeblock(tempbuf%)
1400 tempbuf%>FNgetblock(tempbufsize%)
1410 transptr=0
1420 q%120=tempbuf%
1430 q%124=tempbufsize%
1440 PROCreply(18,6)
1450 ENDIF
1460 WHEN 2:
1470 PROSave(FNgetstr(q%44))
1480 SYS "Wimp_GetPointerInfo",,q%
1490 q%120=q%12
1500 q%124=q%16
1510 q%128=q%
1520 q%132=q%14
1530 !q%44
1540 q%140=8AFF
1550 PROCReply(17,3)
1560 waitingforack%>TRUE
1570 PROCclosemenu
1580 WHEN 3:
1590 IF q%12=0 THEN
1600 PROCloud(FNgetstr(q%44),ok%)
1610 IF ok% THEN
1620 !q%>20
1630 PROCReply(17,4)
1640 ENDIF
1650 ENDIF
1660 WHEN 4:waitingforack%>FALSE
1670 WHEN 6:
1680 IF transptr%>ext(curobj%) saving%=
FALSE
1690 bytestogo%>ext(curobj%)-transptr%
1700 IF bytestogo%>q%124 bytestogo%>q%1
24
1710 SYS "Wimp_TransferBlock",mytask%,b
lock2(curobj%)+transptr%,task%,q%120,byt
estogo%
1720 q%124=bytestogo%
1730 PROCReply(18,7)
1740 transptr%>bytestogo%
1750 WHEN 7:
1760 transptr%>q%124
1770 IF transptr%>tempbufsize% THEN
1780 PROCmainload("Selection",transptr%
)
1790 ELSE
1800 tempbuf%>FNExtendblock(tempbuf%,1
024)
1810 tempbufsize%>1024
1820 q%120=tempbuf%+transptr%
1830 q%124=tempbufsize%-transptr%
1840 PROCReply(18,6)
1850 ENDIF
1860 ENDCASE
1870 ENDPROC
1880 :
1890 DEF PROCReply(messtype%,reason%)
1900 q%12=ref%
1910 q%16=reason%
1920 SYS "Wimp_SendMessage",messtype%,q
%,task%
1930 ENDPROC
1940 :
1950 DEF PROCCheckmouse(mousex%,mousey%,
bx%,hand%,icon%,obx%)
1960 IF (bx% AND X010101)>0 THEN
1970 CASE handle% OF
1980 WHEN -2:IF active% PROCfront ELSE
PROCcreate
1990 WHEN mainhand%:
2000 IF corner%>0 THEN
2010 PROBeginEditcorner(mousex%,mousey%
,bx%)
2020 ELSE
2030 PROCalter(mousex%,mousey%,TRUE)
2040 corner%>0
2050 PROForcedredraw(mainhand%)
2060 ENDIF
2070 WHEN savehand%:
2080 CASE icon% OF
2090 WHEN 0:
2100 PROSave(FNgetstr(savetext))
2110 PROClosemenu
2120 WHEN 3:PROCinitSavedrag(savehand%)
2130 ENDCASE
2140 WHEN zoomhand%:
2150 IF (bx% AND 4)=0 cz%>-1 ELSE cz%>1
2160 CASE icon% OF
2170 WHEN 2:zoom1z+=cz%
2180 WHEN 3:zoom1z-=cz%
2190 WHEN 4:zoom2z+cz%
2200 WHEN 5:zoom2z-=cz%
2210 ENDCASE
2220 PROChangezoom
2230 ENDCASE
2240 ENDIF
2250 IF (bx% AND 2)>0 THEN
2260 CASE handle% OF
2270 WHEN -2:
2280 menuhandle%>101
2290 PROCOpenmenu(quitmenu%,mousex%-86,
176)
2300 WHEN mainhand%:
2310 menuhandle%>102
2320 PROCPreparesmenus
2330 PROCOpenmenu(mainmenu%,mousex%-86,
mouse%)
2340 ENDCASE
2350 ENDIF
2360 ENDPROC
2370 :
2380 DEF PROCmakemenus
2390 menuptr%>menubuf%
2400 selectmenu%>FNmakemenu("winSave,
Delete","Selection")
2410 mainmenu%>FNmakemenu("winInfo,"+
FNsub("Selection",selectmenu%)+","+
winzmz
outUpdate","Stretch")
2420 quitmenu%>FNmakemenu("winInfo,Qu
it","Stretch")
2430 ENDPROC
2440 :
2450 DEF PROCpreparesmenus
2460 PROClick(mainmenu%,3,contup%)
2470 PROLight(mainmenu%,1,curobj%>-1)
2480 IF curobj%>-1 THEN $savetext=f$(cu
robj%)
2490 ENDPROC
2500 :
2510 DEF PROLight(a%,i%,c%)
2520 a%=>a%+36+24*i%
2530 IF c% THEN la%>ia% AND &FFBFFFFF E
LSE ia%>ia% OR 800400000
2540 ENDPROC
2550 :
2560 DEF PROClick(a%,i%,c%)
2570 a%=>a%+28+24*i%
2580 IF c% THEN la%>ia% OR 1 ELSE !a%>
a% AND &FFFFFF
2590 ENDPROC
2600 :
2610 DEF FNsub(m%,m%)="|sub"+RIGHT$(00
0000*STR$(m%),12)+m%
2620 :
2630 DEF PROCmenuitem(text$)
2640 LOCAL menuflags%,iconflags%,submen
u%,indlen%,valid%
2650 valid%>-1
2660 i%>FALSE
2670 indlen%>-1
2680 submenu%>-1
2690 IF text$="" ENDPROC
2700 menuflags%>0
2710 iconflags%>807000021
2720 WHILE LEFT$(text$,1)>=
2730 CASE MIDS(text$,2,3) OF
2740 WHEN "sub":
2750 submenu%>VAL(MIDS(text$,5,12))
2760 text$=MIDS(text$,7,17)
2770 WHEN "win":
2780 CASE MIDS(text$,5,2) OF
2790 WHEN "sv":submenu%>savehand%
2800 WHEN "zm":submenu%>zoomhand%
2810 WHEN "id":submenu%>infohand%
2820 ENDCASE
2830 text$=MIDS(text$,7,7)
2840 ENDCASE
2850 ENDWHILE
2860 IF LEN(text$)>menumax% menumax%>LE
N(text$)
2870 menuptr%>10=menuflags%
2880 menuptr%>14=submenu%
2890 menuptr%>18=iconflags%
2900 IF LEN(text$)>11 indlen%>LEN(text$)
2910 IF indlen%<0 THEN
2920 $(menuptr%+12)=text$)
2930 ELSE
2940 menend%>=(indlen+1)
2950 menuptr%>18=(menuptr%>8) OR >100000
000
2960 menuptr%>12=menend%
2970 menuptr%>16=valid%
2980 menuptr%>20=indlen%
2990 $menend%>text$)
3000 ENDIF
3010 menuptr%>24
3020 ENDPROC
3030 :
3040 DEF FNpar(sep$)
3050 11%>i%1:1%>INSTR(menu$+sep$,sep$,
11%)
3060 =MIDS(menu$,i%,1%,11-i%)
3070 :
3080 DEF FNmakemenu(menu$,menutitle$)
3090 LOCAL menumax%,wasptr%
3100 wasptr%>menuptr%
3110 menumax%>10
3120 i%=>0
3130 menuptr%>120=40
3140 $menutitle%>menutitle$)
3150 menuptr%>212=7
3160 menuptr%>213=2
3170 menuptr%>214=7
3180 menuptr%>215=7
3190 maxaddr%>menuptr%+16
3200 menuptr%>24=0
3210 menuptr%>28
3220 REPEAT
3230 item$=FNpar("",)
3240 PROCMenuItem(item$)
3250 UNTIL item$=""
3260 menuptr%>24=(menuptr%>24) OR 880
3270 !maxaddr%>menumax%+16+32
3280 =wasptr%
3290 :
3300 DEF PROCOpenmenu(m%,x%,y%)
3310 menux%>x%
3320 menuy%>y%
3330 SYS "Wimp_CreateMenu",,m%,x%,y%
3340 ENDPROC
3350 :
3360 DEF PROCinitSavedrag(savehand%)
3370 LOCAL x%,y%,ysize%
3380 !q%>savehand%
3390 SYS "Wimp_GetWindowState",,q%
3400 ysize%>q%16-q%8
3410 x%>q%14
3420 y%>q%18
3430 q%14=3
3440 SYS "Wimp_GetIconState",,q%
3450 q%18=>x%
3460 q%12+q%18+ysize%
3470 q%16=>x%
3480 q%120=>y%+ysize%
3490 q%124=0
3500 q%128=0

```

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```

3510 q%!32=1279
3520 q%136=1023
3530 lqx=0
3540 q%14=5
3550 dragging%=true
3560 sys "Wimp_DragBox",,q%
3570 ENDPROC
3580 :
3590 DEF FNicombar
3600 LOCAL iix
3610 !cx=-1:ic%14=0:ic%18=0:ic%12=64:
ic%16=68
3620 ic%120=87000311A
3630 DIM ic%124 12
3640 $ic%126="!Stretch"
3650 ic%128=1
3660 ic%132=12
3670 SYS "Wimp_CreateIcon",,ic% TO iix
3680 =iix
3690 :
3700 DEF PROCmenuselect(menu%)
3710 CASE menuhandle% OF
3720 WHEN 101: IF !menu%1=1 PROCshutdown
wimp
3730 WHEN 102: PROCdecodemainmenu
3740 ENDCASE
3750 ENDPROC
3760 :
3770 DEF PROCdecodemainmenu
3780 LOCAL redo%
3790 SYS "Wimp_GetPointerInfo",,q2%
3800 redo%=((q2%18 AND 1)>0)
3810 CASE !menu% OF
3820 WHEN 1:
3830 IF menu%14=1 THEN
3840 PROCfreeblock(block(curobj%))
3850 PROCfreeblock(block2(curobj%))
3860 PROCfreeblock(points(curobj%))
3870 loaded%=-1
3880 curobj%=-1
3890 PROCforcedraw(mainhand%)
3900 ENDIF
3910 WHEN 3: contup%!=NOT contup%
3920 ENDCASE
3930 IF redo% PROCprepmenus: PROCOpen
menu(mainmenu%, menu%, menu%)
3940 ENDPROC
3950 :
3960 DEF PROChutdownwimp
3970 $q%="TASK"
3980 SYS "Wimp_CloseDown",mytask%,!q%
3990 END
4000 ENDPROC
4010 :
4020 DEF PROfront
4030 lqx=mainhand%
4040 SYS "Wimp_GetWindowState",,q%
4050 q%128=1
4060 SYS "Wimp_OpenWindow",,q%
4070 ENDPROC
4080 :
4090 DEF PROcreopen
4100 !q%!=mainhand%:q%128=-1
4110 q%14=200:q%18=300
4120 q%12=700:q%16=800
4130 q%120=q%124=0
4140 SYS "Wimp_OpenWindow",,q%
4150 active%=true
4160 ENDPROC
4170 :
4180 DEF FNcreatewindow(name%)
4190 LOCAL hand%
4200 SYS "Wimp_LoadTemplate",,templates
%,ind%,inirx%&1FF,-1,names$,0 TO ,ind%
4210 templates%168=10(10<16)
4220 SYS "Wimp_CreateWindow",,templates
% TO hand%
4230 =hand%
4240 :
4250 DEF PROclosewindow(hand%)
4260 lqx=hand%
4270 SYS "Wimp_CloseWindow",,q%
4280 IF hand%!=mainhand% active%=false
4290 ENDPROC
4300 :
4310 DEF PROcreextract(q%)
4320 ax0=q%14-q%120
4330 ay0=q%116-q%124
4340 ENDPROC
4350 :
4360 DEF PROCforcedraw(hand%)
4370 lqx=hand%
4380 SYS "Wimp_GetWindowInfo",,q%
4390 SYS "Wimp_ForceRedraw",hand%,q%14
4,q%148,q%152,q%156
4400 ENDPROC
4410 :
4420 DEF PROCsav(f$)
4430 PROCbounds(block2(curobj%),ext(cur
obj%))
4440 SYS "OS_File",10,f$,8AFF,,block2(c
urobj%),block2(curobj%)+ext(curobj%)
4450 ENDPROC
4460 :
4470 DEF PROCload(f$,RETURN ok%)
4480 LOCAL type%,ftype%,in%,s%,l%,ext
4490 ok%=false
4500 IF f$>"" THEN
4510 SYS "OS_File",5,f$ TO type%,ftype%
%,ext
4520 IF type%1 AND (ftype% AND &FFFFF
00)=dft THEN
4530 IF loaded%&max%1 PROCmainload(f$,e
xt,PROCCELLTHEMOFF("You may only l
oad "+STR$(max%)+" Draw files")
4540 ENDIF
4550 ENDIF
4560 IF ok% AND (NOT active%) PROCsetex
tents:PROCreopen
4570 ENDPROC
4580 :
4590 DEF PROCmainload(f$,ext)
4600 LOCAL l%,mx%,my%,mb%
4610 MOUSE mx%,my%,mb%
4620 SYS "Hourglass_On"
4630 n%0
4640 WHILE block(n%)>-1
4650 n%+=1
4660 ENDWHILE
4670 block(n%)=FNgetblock(ext)
4680 block2(n%)=FNgetblock(ext)
4690 points(n%)=FNgetblock(ext)
4700 IF f$="Selection" THEN
4710 FOR ix=1 TO ext-1
4720 !z2block(n%)=!z2tempbuf%
4730 !z2block(n%)=!z2tempbuf%
4740 NEXT
4750 PROCfreeblock(tempbuf%)
4760 ELSE
4770 SYS "OS_File",255,f$,block(n%)
4780 SYS "OS_File",255,f$,block2(n%)
4790 ENDIF
4800 !points(n%)=0
4810 x(n%,1)=block(n%)!24
4820 y(n%,1)=block(n%)!28
4830 x(n%,2)=block(n%)!32
4840 y(n%,2)=block(n%)!28
4850 x(n%,3)=block(n%)!32
4860 y(n%,3)=block(n%)!36
4870 x(n%,4)=block(n%)!24
4880 y(n%,4)=block(n%)!36
4890 lq2%=mainhand%
4900 SYS "Wimp_GetWindowState",,q%
4910 PROCreextract(q%2)
4920 offx%=(mx%-ax0%)*zoom2%/zoom1%
4930 offy%=(my%-ay0%)*zoom2%/zoom1%
+pagesize%
4940 ext(n%)=ext
4950 f$(n%)=f$
4960 loaded%+=1
4970 ok%=true
4980 SYS "Hourglass_Off"
4990 PROCforcedraw(mainhand%)
5000 ENDPROC
5010 :
5020 DEF PROCELLTHEMOFF(t$)
5030 !buffer%0
5040 $!buffer%4=t$+CHR$(0)
5050 SYS "Wimp_ReportError",buffer%,1,
"Stretch"
5060 ENDPROC
5070 :
5080 DEF PROCerrbox
5090 LOCAL what%
5100 SYS "Wimp_DragBox",,-1
5110 !buffer%ERR *
5120 $!buffer%4=REPORT$+" / "+STR$ERL
+CHR$0
5130 SYS "Wimp_ReportError",buffer%,3,
"Stretch" TO ,what%
5140 IF what%2=PROCshutdownwimp
5150 ENDPROC
5160 :
5170 DEF PROCinitwindows
5180 DIM templates% 8800,indir% 8800
5190 ind%indir%
5200 SYS "Wimp_OpenTemplate",,"<Stretch
$!ir>.Templates"
5210 mainhand%=FNcreatewindow("Main")
5220 savehand%=FNcreatewindow("Save")
5230 zoomhand%=FNcreatewindow("Magnifie
r")
5240 infohand%=FNcreatewindow("Info")
5250 SYS "Wimp_CloseTemplate"
5260 savetext%=$!textaddr(saveshand%,2)
5270 $!textaddr(infohand%,4)="0.50 (1s
t July 1990)"
5280 ENDPROC
5290 :
5300 DEF PROCinitflags
5310 dragging%=false
5320 waitingforack%=false
5330 corner%0
5340 dragtype%0
5350 contup%false
5360 loaded%0
5370 curobj%=-1
5380 zoom1%1:zoom2%1
5390 active%false
5400 tempbuf%=-1
5410 PROCsetzoom
5420 ENDPROC
5430 :
5440 DEF PROCchangezoom
5450 IF zoom1%1 zoom1%1
5460 IF zoom1%8 zoom1%8
5470 IF zoom2%1 zoom2%1
5480 IF zoom2%8 zoom2%8
5490 PROCsetzoom
5500 :
5510 PROCredrawicon(zoomhand%,0)
5520 PROCredrawicon(zoomhand%,1)
5530 PROCsetextents
5540 ENDPROC
5550 :
5560 DEF PROCextendl(hand%,icon%)
5570 LOCAL l%
5580 PROCgeticoninfo(hand%,icon%)
5590 WHILE l%?iconinf%128)>=32
5600 l%+=1
5610 ENDWHILE
5620 SYS "Wimp_SetCaretPosition",hand%,
icon%,,-1,i%
5630 ENDPROC
5640 :
5650 DEF PROCredrawicon(hand%,icon%)
5660 LOCAL more%
5670 PROCgeticoninfo(hand%,icon%)
5680 lq2%hand%
5690 q2%14iconinf%18
5700 q2%18iconinf%12
5710 q2%12=iconinf%16
5720 q2%16=iconinf%20
5730 SYS "Wimp_UpdateWindow",,q% TO mo
re%
5740 WHILE more%
5750 SYS "Wimp_GetRectangle",,q% TO mo
re%
5760 ENDWHILE
5770 ENDPROC
5780 :
5790 DEF PROCsetzoom
5800 PROCseticonval(zoomhand%,0,zoom1%)
5810 PROCseticonval(zoomhand%,1,zoom2%)
5820 ENDPROC
5830 :
5840 DEF PROCseticonval(hand%,icon%,val
%)=0
5850 LOCAL v$%
5860 v$=STR$(val%)
5870 $!Textaddr(hand%,icon%)+LEN(v$))
5880 ?FNtextaddr(hand%,icon%)+LEN(v$))
5890 ENDPROC
5900 :
5910 DEF PROCclosemenu
5920 SYS "Wimp_CreateMenu",,-1
5930 ENDPROC
5940 :
5950 DEF PROCsetextents
5960 LOCAL smaller%,size%
5970 size%zoom1%zoom2%pagesize%
5980 lq2%mainhand%
5990 SYS "Wimp_GetWindowState",,q%
6000 smaller%size%<(q2%12-q2%14)
6010 lq%0
6020 q14%size%
6030 q18%size%
6040 q12=0
6050 SYS "Wimp_SetExtent",mainhand%,q%
6060 IF smaller% THEN
6070 q2%12=q2%14+size%
6080 q2%18=q2%16-size%
6090 qz120=
6100 qz124=
6110 SYS "Wimp_OpenWindow",,q%
6120 ELSE
6130 IF q2%124-(q2%16-q2%18)<-size% AN
D active% THEN
6140 qz124-=size%+(q2%16-q2%18)
6150 SYS "Wimp_OpenWindow",,q%
6160 ENDIF
6170 ENDIF
6180 ENDPROC
6190 :
6200 DEF PROCinitheap
6210 heap%=HIMEM
6220 heapsize%32*1024
6230 SYS "Wimp_SlotSize",,-1,-1 TO appsi
ze%
6240 SYS "Wimp_SlotSize",appsize%+heaps
ize%,-1
6250 SYS "OS_Heap",0,heapd%,heapsiz%
6260 ENDPROC
6270 :
6280 DEF FNgetblock(size%)
6290 LOCAL loc%,ok%,heappul%,largest%
6300 heapfull%=false
6310 REPEAT
6320 SYS "OS_Heap",1,heappd% TO ,large
s%
6330 IF largest%>size% THEN
6340 SYS "OS_Heap",2,heappd%,size% TO ,
loc%
6350 ok%true
6360 ELSE
6370 heappul%FNtrytoextendheap
6380 ENDIF
6390 UNTIL ok% OR heappul%
6400 IF heappul% THEN ERROR 17,"Stretc
h has run out of memory"
6410 =loc%
6420 :
6430 DEF FNextendblock(loc%,size%)
6440 LOCAL ok%,heappul%,newloc%
6450 IF loc<=0 THEN FNgetblock(size%)
6460 heappul%=false
6470 REPEAT
6480 SYS "OS_Heap",4,heappd%,loc%,size%
TO ,newloc%;ok%
6490 ok%=(ok% AND 1)=0
6500 IF NOT ok% THEN heappul%FNtrytoe
xtendheap
6510 UNTIL ok% OR heappul%
6520 IF heappul% THEN ERROR 17,"Stretc
h has run out of memory"
6530 =newloc%
6540 :
6550 DEF FNtrytoextendheap
6560 LOCAL heappul%,new%
6570 SYS "XWimp_SlotSize",appsize%+heaps
ize%+32*1024,-1 TO new%;heappul%
6580 heappul%=(heappul% AND 1)=1
6590 IF new%>appsize%+heapsiz% THEN he
appul%true
6600 IF NOT heappul% THEN
6610 heapsize%32*1024
6620 SYS "OS_Heap",5,heappd%,32*1024
6630 ENDIF
6640 =heappul%
6650 :
6660 DEF PROCfreeblock(RETURN loc%)
6670 IF loc>0 THEN SYS "OS_Heap",3,he
apd%,loc%
6680 loc%=-1
6690 ENDPROC
6700 :
6710 DEF PROCalter(mousex%,mousey%,doit
%)=0
6720 LOCAL l%,x,y
6730 IF dragtype%0 THEN
6740 !q2%mainhand%
6750 SYS "Wimp_GetWindowState",,q%
6760 PROCreextract(q%2)
6770 x=mousex%-ax0%-(offx%(curobj%))*z
oom1%zoom2%
6780 y=mousey%-ay0%-(offy%(curobj%))-p
agesize%*zoom1%zoom2%
6790 paths=0
6800 ptr=0
6810 base=block(curobj%)
6820 PROCfileheader
6830 x(curobj%,corner%)=8100*x/scale+x
l%
6840 y(curobj%,corner%)=8100*y/scale+y
l%
6850 IF doit% PROCdistort(block(curobj%
),block2(curobj%),curobj%)
6860 ELSE
6870 offx%(curobj%)+(mousex%-dragx%)*z
oom2%zoom1%
6880 offy%(curobj%)+(mousey%-dragy%)*z
oom2%zoom1%
6890 ENDIF
6900 PROCforcedraw(mainhand%)
6910 ENDPROC
6920 :
6930 DEF PROCbeginedcorner(mousex%,mo
usey%,b%)=0
6940 LOCAL l%,x,y,xpos,ypos,oldcuro
bj%,minx,miny,maxx,maxy
6950 lq2%mainhand%
6960 SYS "Wimp_GetWindowState",,q%

```

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STRETCH

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```

6970 PROExtract(q2x)
6980 corner:=0
6990 oldcurobj%:=curobj%
7000 curobj%:=1
7010 IF loaded>0 THEN
7020 FOR i%:=0 TO max%:=1
7030 IF block(j%)>1 THEN
7040 xpos:=0
7050 ypos:=0
7060 x=mousex%-ax0%-offx%(j%)*zoom1%
zoom2%
7070 y=mousey%-ay0%+(pagesize%-offy%(j%))
)z*zoom1%/zoom2%
7080 ptr:=0
7090 base=block(j%)
7100 PROCfileheader
7110 minx=FNxs(j%,1)
7120 maxx=maxx
7130 miny=FNys(j%,1)
7140 maxy=maxy
7150 FOR i%:=2 TO 4
7160 IF FNxs(j%,i%)<minx minx=FNxs(j%,i)
7170 IF FNxs(j%,i%)>maxx maxx=FNxs(j%,i)
7180 IF FNys(j%,i%)<miny miny=FNys(j%,i)
7190 IF FNys(j%,i%)>maxy maxy=FNys(j%,i)
7200 NEXT
7210 IF x==minx-16 AND x<=maxx+16 AND y
>=miny-16 AND y==maxy+16 THEN
7220 curobj%:=j%
7230 FOR i%:=1 TO 4
7240 IF ABS(x-FNxs(j%,i%))<16 AND ABS(y
-FNys(j%,i%))<16 THEN
7250 curobj%:=j%
7260 corner:=1%
7270 dragx%:=mousex%
7280 dragy%:=mousey%
7290 IF (b% AND 4)=0 dragtype%:=1 ELSE d
ragtype%:=0
7300 PROCforcedraw(mainhand%)
7310 ENDIF
7320 NEXT
7330 ENDIF
7340 ENDIF
7350 NEXT
7360 ENDIF
7370 IF oldcurobj%<>curobj% PROCforcere
draw(mainhand%)
7380 ENDPROC
7390 :
7400 DEF PROCinitdraw
7410 maxf%=8
7420 pagesize%:=1000
7430 DIM offx%(maxf%),offy%(maxf%),ext(
maxf%)
7440 DIM block(maxf%),block2(maxf%),poi
nts(maxf%),t$%maxf%
7450 DIM x(maxf%,4),y(maxf%,4)
7460 block()=-1
7470 block2()=-1
7480 points()=-1
7490 DIM mat 6x4,caps 4*4
7500 xsize=800:ysize=600
7510 corner=0
7520 dft=0xFFFFFFF0
7530 ENDPROC
7540 :
7550 DEF PROCdraw(base,xpos,ypos,objec
t,corner)
7560 LOCAL i%
7570 paths=0
7580 ptr=0
7590 PROCfileheader
7600 IF corner=0 OR contup% THEN
7610 REPEAT
7620 PROCobject
7630 UNTIL ptr=ext(object%)
7640 ENDIF
7650 IF object%>=curobj% OR corner>0 TH
EN
7660 SYS "Wimp_SetColour",11
7670 MOVE FNxs(object%,1),FNys(object%,
1)
7680 DRAW FNxs(object%,2),FNys(object%,
2)
7690 DRAW FNxs(object%,3),FNys(object%,
3)
7700 DRAW FNxs(object%,4),FNys(object%,
4)
7710 DRAW FNxs(object%,1),FNys(object%,
1)
7720 ENDIF
7730 IF object%>=curobj% THEN
7740 FOR i%:=1 TO 4
7750 RECTANGLE FNxs(curobj%,i%)-12,FNys
(curobj%,i%)-12,32,32
7760 NEXT
7770 ENDIF
7790 :
7800 DEF FNxs(o,n)
7810 ==((x(o,n)-xlo)/&100*scale+xpos)
7820 :
7830 DEF FNys(o,n)
7840 ==((y(o,n)-ylo)/&100*scale+ypos)
7850 :
7860 DEF PROCfileheader
7870 Draw$=FNstring(4)
7880 major=Nword
7890 minor=Nword
7900 id$=FNstring(12)
7910 PROGetbox(xlo,ylo,xhi,yhi)
7920 mscale=&1000*zoom1%/zoom2%
7930 scale=&mscale/&10000
7940 mat0=mscale:mat12=mscale
7950 mat8=0:mat11=mat12=mscale
7960 mat16=xpos*&100-xlo*scale
7970 mat20=ypos*&100-ylo*scale
7980 ENDPROC
7990 :
8000 DEF PROCObject
8010 LOCAL type,size,xlo,ylo,xhi,yhi
8020 type=FNword
8030 size=FNword
8040 IF type>0 AND type<7 PROGetbox(
xlo,ylo,xhi,yhi)
8050 CASE type OF
8060 WHEN 0,1,5,9,10:PROCskipobj
8070 WHEN 2:PROCpath
8080 WHEN 6:PROCgroup
8090 WHEN 7:PROCtagged
8100 OTHERWISE:ERROR 0,"Unknown Draw ob
ject"
8110 ENDCASE
8120 ENDPROC
8130 :
8140 DEF PROCskipobj
8150 IF type=0 ptr+=size-2*4 ELSE ptr
+=size-6*4
8160 ENDPROC
8170 :
8180 DEF PROCpath
8190 pathend=ptr-6*4+size
8200 fillcol=FNword
8210 linecol=FNword
8220 linewidth=FNword
8230 linestyle=FNword
8240 dash=FNdashpat
8250 caps0=(linestyle AND &000011)
8260 caps1=(linestyle AND &001100)>>2
8270 caps2=(linestyle AND &110000)>>4
8280 caps3=0
8290 caps4=10&810000
8300 tricapw=(linestyle>>16) AND &FF
8310 tricapl=(linestyle>>24) AND &FF
8320 tricap=((tricapl/16&100)<16)+(tr
icapw/16&100)
8330 caps8=tricap
8340 caps12=tricap
8350 IF linestyle AND 64 THEN style=2 E
LSE style=0
8360 points(object%):(paths+0)=ptr
8370 points(object%):(paths+4)=0
8380 paths+=4
8390 IF fillcol<0 THEN
8400 SYS "ColourTrans_SetGCOL",fillcol
8410 SYS "Draw_Fill",base+ptr,style OR
&110000,mat,0
8420 ENDIF
8430 IF linecol<0 THEN
8440 SYS "ColourTrans_SetGCOL",linecol
8450 IF linewidth=0 THEN lstyle=style 0
R &011000 ELSE lstyle=style OR &110000
8460 SYS "Draw_Stroke",base+ptr,lstyle,
mat,0,linewidth,caps,dash
8470 ENDIF
8480 ptr+=pathend
8490 ENDPROC
8500 :
8510 DEF FNdashpat'
8520 IF linestyle AND 128 THEN
8530 dash=base+ptr
8540 dashoff=FNword
8550 dashnum=FNword
8560 ptr+=dashnum*4
8570 ELSE
8580 dash=0
8590 ENDIF
8600 dash
8610 :
8620 DEF PROCgroup
8630 LOCAL end
8640 name$=FNstring(12)
8650 end=ptr-12-6*4+size
8660 REPEAT
8670 PROCobject
8680 UNTIL ptr=end
8690 ENDPROC
8700 :
8710 DEF PROCtagged
8720 ident=FNword
8730 PROCobject
8740 ENDPROC
8750 :
8760 DEF FNstring(letters)
8770 w$=""
8780 FOR i:=1 TO letters
8790 w$+=FNchar
8800 NEXT
8810 w$=
8820 :
8830 DEF PROGetbox(RETURN xl,RETURN yl
,RETURN xh,RETURN yh)
8840 xL=Nword:yL=FNword
8850 xH=Nword:yH=FNword
8860 ENDPROC
8870 :
8880 DEF FNchar
8890 =CHR$#Nbyte
8900 :
8910 DEF FNbyte
8920 byte=base?ptr
8930 ptr+=1
8940 =byte
8950 :
8960 DEF FNword
8970 base+ptr
8980 ptr+=4
8990 =word
9000 :
9010 DEF PROCdistort(read,write,objec
t)
9020 SYS "Hourglass_On"
9030 addr+=0
9040 REPEAT
9050 DEF points(object%):addr
9060 IF path>0 THEN
9070 REPEAT
9080 element=read:path
9090 path+=4
9100 CASE element OF
9110 WHEN 2,3,7,8:PROCadjust(object%,1)
9120 WHEN 6:PROCadjust(object%,3)
9130 ENDCASE
9140 UNTIL element=0
9150 ENDIF
9160 addr+=4
9170 UNTIL path=0
9180 SYS "Hourglass_Off"
9190 ENDPROC
9200 :
9210 PROCadjust(o,n)
9220 FOR i=1 TO n
9230 x$!=read+path+0
9240 y$!=read+path+4
9250 px=(x$lo)/(xhi-xlo)
9260 py=(y$lo)/(yhi-ylo)
9270 xx$=(o,1)+px*(x(o,2)-(x(o,1))+py*(x
(o,4)-x(o,1))+px*(x(o,3)-x(o,4)-x(o,2)+x
(o,1)))
9280 yy$=(o,1)+px*(y(o,2)-y(o,1))+py*(y
(o,4)-y(o,1)+px*(y(o,3)-y(o,4)-y(o,2)+y
(o,1)))
9290 !(w$read+path+0)=xx
9300 !(w$read+path+4)=yy
9310 path+=8
9320 NEXT
9330 ENDPROC
9340 :
9350 DEF PROBounds(base,ext)
9360 bound_xL=0:bound_xhi=-1E38
9370 bound_yL=0:bound_yhi=-1E38
9380 ptr+=40
9390 REPEAT
9400 PROCobjectbound
9410 UNTIL ptr=ext
9420 base+24=bound_xL
9430 base+28=bound_yL
9440 base+32=bound_xhi
9450 base+36=bound_yhi
9460 ENDPROC
9470 :
9480 DEF PROCobjectbound
9490 type=FNword
9500 size=FNword
9510 CASE type OF
9520 WHEN 0:ptr+=size-8
9530 WHEN 1,5,9,10:PROGetboundbox
9540 WHEN 2:PROCcalcboundbox
9550 WHEN 5:PROCgetboundbox
9560 WHEN 6:PROCgroupbound
9570 WHEN 7:PROCTaggedbound
9580 OTHERWISE:ERROR 0,"Unknown draw ob
ject: $STRtype
9590 ENDCASE
9600 IF type>0 THEN
9610 IF obj_xlo<bound_xlo bound_xlo=obj
_xlo
9620 IF obj_xhi>bound_xhi bound_xhi=obj
_xhi
9630 IF obj_ylo<bound_ylo bound_ylo=obj
_ylo
9640 IF obj_yhi>bound_yhi bound_yhi=obj
_yhi
9650 ENDFILE
9660 ENDPROC
9670 :
9680 DEF PROGetboundbox
9690 PROGetbox(obj_xlo,obj_ylo,obj_xhi
,yhi)
9700 ptr+=(size-6*4)
9710 ENDPROC
9720 :
9730 DEF PROCalcboundbox
9740 bounds=base+ptr
9750 PROGetbox(z,z,z,z)
9760 pathend=ptr-6*4+size
9770 fillcol=FNword
9780 Linecol=FNword
9790 Linewidth=FNword
9800 Linestyle=FNword
9810 dash=FNdashpat
9820 IF linestyle AND 64 THEN style=2 E
LSE style=0
9830 SYS "Draw_ProcessPath",base+ptr,(%
01111<27) OR %110000 OR style,0,0,Linew
idth,caps,dash,bounds 0 (<31)
9840 obj_xlo=bound_xL
9850 obj_ylo=bound_yL
9860 obj_xhi=bound_xH
9870 obj_yhi=bound_yH
9880 ptr+=pathend
9890 ENDPROC
9900 :
9910 DEF PROCgroupbound
9920 LOCAL bound_xL,bound_yL,bound_xh
i,bound_yhi,end
9930 bound_xL=0:bound_xhi=-1E38
9940 bound_yL=0:bound_yhi=-1E38
9950 PROGetbox(z,z,z,z)
9960 name$=FNstring(12)
9970 end=ptr-12-6*4+size
9980 REPEAT
9990 PROCobjectbound
10000 UNTIL ptr=end
10010 obj_xlo=bound_xL:obj_ylo=bound_yL
10020 obj_xhi=bound_xH:obj_yhi=bound_yH
10030 ENDPROC
10040 :
10050 DEF PROCTaggedbound
10060 ident=FNword
10070 PROCobjectbound
10080 ENDPROC
000 :
80 DIM w% free%
90 READ apps
100 REPEAT
110 PROCins(app$)
120 INPUT"Enter destination directory:
"app$
130 IF app$="" app$="@"
140 SYS "XOS_File",5,app$ TO type%
150 UNTIL type%=
160 REPEAT
170 READ file$%
180 IF file$="" THEN
190 file$=app$+"\"+file$%
200 PRINT"Creating file ""file$"""
210 READ load%,exec%,olen%,attrib%
220 p$=0
230 d$=""
240 d%:=1
250 WHILE p%<olen%

```

Listing 1

```

10 REM >MakeApp
20 REM Creates !Stretch data files
30 REM by Chris Ruseman
40 REM for Archimedes only
50 REM (c) BAU September 1990
60 :
70 free%=(HIMEM-END-88000) AND &FFFF
000 :
80 DIM w% free%
90 READ apps
100 REPEAT
110 PROCins(app$)
120 INPUT"Enter destination directory:
"app$
130 IF app$="" app$="@"
140 SYS "XOS_File",5,app$ TO type%
150 UNTIL type%=
160 REPEAT
170 READ file$%
180 IF file$="" THEN
190 file$=app$+"\"+file$%
200 PRINT"Creating file ""file$"""
210 READ load%,exec%,olen%,attrib%
220 p$=0
230 d$=""
240 d%:=1
250 WHILE p%<olen%

```

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ARM PROGRAMMING

 **Continued**

```

600 b%+=1
590 ENDIF
580 b%+=EVAL("&LEFT$(d$,2))
590 d$=MIDS(d$,3)
600 b%=
610 :
620 DEF PROCins(i$)
630 LOCAL i%
640 FOR i%=1 TO LEN(i$)
650 SYS "OS_Byte",138,0,ASC(MIDS(i$,i%,1))
))
```

```
660 NEXT
670 ENDPROC
680 :
690 DATA $,!Stretch
700 DATA "Iboot"
710 DATA &FFFFEB42,87C7EB1A0
720 DATA $20,&83
730 DATA 49636F6E53707269746573,39
740 DATA 2034C62657924469723E,76
750 DATA 2E2187140A,44
760 DATA "1run"
770 DATA &FFFFEB42,87E9994A7
780 DATA $80,&83
790 DATA 7C2053747265746368200A,31
800 DATA 7C2044342384444C0203139,85
810 DATA 38390AD0A536574881C2444,1
820 DATA 6972203C382656795803E,14
830 DATA 0A2449636F6E5370726974,75
840 DATA 6573203C8B253E2E218817,84
850 DATA 05240456E7375725620,69
860 DATA 436F6C6F757254,72611673,48
870 DATA 20302083184C6F1684838,38
880 DATA 797374656205061746683E,57
890 DATA 406F64756C65732B882673,89
900 DATA 0A5769670536C6F7420020,18
910 DATA 60696E2033964B83306178,99
920 DATA 8409835756E88B22E183,77
```

```

930 DATA 10496061676520252A300A,68
940 DATA ":"!print
950 DATA &FFFFF942,&87E215C45
960 DATA &2E00,83
970 DATA 0100000108304E4020000,82
980 DATA D483042173747265746368,45
990 DATA S3170004871C80D7C8328,43
1000 DATA 28C828C883310C83347777,60
1010 DATA 77BBBBB8B8788309777,79
1020 DATA B87877872800008031889,72
1030 DATA 00082978298299629983,74
1040 DATA 20842C88B8B0007097830,69
1050 DATA B787841679838297977,48
1060 DATA BBBB87816415814B8451,24
1070 DATA 79842878BB8297970080,92
1080 DATA 088477E778299898298983,57
1090 DATA AC8375861464640772999,80
1100 DATA B888814836308047040,23
1110 DATA 73846C89280007004707,86
1120 DATA 7488148287000767676,68
1130 DATA 77882883997097080783,88
1140 DATA E10774829788308040C8578,6
1150 DATA 288280700407472829989,80
1160 DATA B8704F898B80A314B084,14
1170 DATA 28840C8914792908514B83,83
1180 DATA BBB83F8F058298299797,54
1190 DATA 57865086F1863E82B79814,96
1200 DATA 84E8F4896783F0383F84,2
1210 DATA 6F6FF08ACB913FF0901584,59
1220 DATA 139115953985298549214,54
1230 DATA F00F8828877EFF80140F86,60
1240 DATA 99802864795289500A28C,53
1250 DATA A2C9A1F04D3F493FA8EC00,69
1260 DATA "Templates"
1270 DATA &FFFFECC42,&87E180992
1280 DATA &851F,83
1290 DATA FFFFFFFF00000000B30485,88
1300 DATA 07748304040100001815,89
1310 DATA 7361766508710B8831452,25
1320 DATA 87186051676669669572,5
1330 DATA 83100A0300005883481618,15
1340 DATA 696E0D87182631880B784,36
1350 DATA 696E66F8848846C8534,53
1360 DATA 04020000050400000A8308,5
1370 DATA 88804070000120038284,22
1380 DATA 070207010C0E0C8697FC83,23
1390 DATA A0558623084A93086984,93
1410 DATA 65833B800C083960331E,89
1420 DATA 83D1829038039290017,97
1430 DATA 4F4B0D749746C65643E0D,88
1440 DATA F6108388883T116837C7E,70
1450 DATA 83F9116100173883E8333,22
1460 DATA FF1E83FF0A87408A8840F1,7
1470 DATA 000743872084F984E8A683,83
1480 DATA 60829C83F0ECC83683A6000,78
1490 DATA 1766996C6561666066F,59
1500 DATA 60E8D29B83E0C88380483,46
1510 DATA F8388480600073555688,66
1520 DATA 80664484CFEEF874F83F3,47
1530 DATA 2C9320E3F20C848C83E1,46
1540 DATA 39C34046835206616665,29
1550 DATA 83F20C83CC88B00E83CC3C,70
1560 DATA 6883003F004583B5807,87
1570 DATA 00001200182847020700,97
1580 DATA 040B8719FC83CD0583F483,63
1590 DATA E43B03F0428687038A887,13
1600 DATA E01183FC833B048871882,75
1610 DATA 8483E28830F31F000742,75
1620 DATA 83F44C83D04846782887839,90
1630 DATA C88820F100074983F04B87,70
1640 DATA 201283E41483E83A83E84,49
1650 DATA F05D20001782880896485,36
1660 DATA 20E883FC84188720828A,70
1670 DATA 8920887408A4194408240,55
1680 DATA 840484C194047887088294,82
1690 DATA 87C0010300075087F640C83,32
1700 DATA FB4D1676E69666965720D,78
1710 DATA 39061302839860739030A,86
1720 DATA 0848E083EAD483E77403,7
1730 DATA B7E7F3207C0784FA01F07,51
1740 DATA 02070003018397F683F83,82
1750 DATA 820586638384E08586185,82
1760 DATA 7C5372765763680D84E,40
1770 DATA 84C96C8282884F86361,82
1780 DATA 5C88253F84E0835120003,5
1790 DATA 82843585010C0E93588451,56
1800 DATA 508A587867C61385F6983,65
1810 DATA FA4A83183483975483A64,7
1820 DATA 83D3F30D8007040B07469,68
1830 DATA 746C65837C8E289383FEC,7
1840 DATA 83F7763839752763F06100,63
1850 DATA 0782887441483E842082,60
1860 DATA 988720C88720829387641A,24
1870 DATA 8720845884289487407,27
1880 DATA 878288740308760608760,12
1890 DATA BC8741A7383F3AE83F0D083,84
1900 DATA B18488F8838919000174,35
1910 DATA 61606530A086600E83F282,89
1920 DATA 9C8720C48720507572706F,20
1930 DATA 738323830844688874082,37
1940 DATA 908740417574868F72304D,41
1950 DATA 8840387600848084605665,62
1960 DATA 7273696F8E85404626F75,43
1970 DATA 7420746869732070726F67,60
1980 DATA 726160058372675746368,66
1990 DATA 0D442761772046696C6520,59
2000 DATA 871265720A92042415520,30
2010 DATA 5365707465606265722031,16
2020 DATA 3939500000,88
2030 DATA *
E38
100 REM >Distort
102 REM by Chris Ruseman
103 REM for Archimedes Only
104 REM (c) BAU September 1990
105 :
106 MODE 12:OFF
107 ON ERROR MODE 0:REPORT:PRINT" at l
ine;"ERL:END
108 PROCinit
109 PROCbounding
110 PROCdraw(x,y())
111 REPEAT
112 MOUSE x,y,z
113 IF (z AND 0) THEN
114 IF corner=0 THEN
115 FOR I=1 TO 4
116 IF ABS(x-y(i))<16 AND ABS(y-(y(i))<
117 corner=i
118 NEXT
119 ELSE
120 x<(corner)=x
121 y<(corner)=y
122 xy2)=x/y
123 PROCdistort(x,y2)
124 PROCdraw(x,y2)
125 ENDIF
126 corner=0
127 UNTIL0
128 :
129 DEF PROCinit
130 x(y)=x
131 y(x)=y
132 DIM xy(x,y),x4,y4,xy2,xy3
133 xy(y)=200,100,500,200,600,100,50
134 x4=600,500,400,400,200,500,300,20
135 x5=200,100
136 SYS 6,113,1
137 SYS 6,112,2
138 bank=2
139 corner=0
140 x(y)=POINTER 1
141 ENDPROC
142 :
143 DEF PROCbounding
144 x(y)=x
145 y(x)=y
146 x4(y)=x
147 y4(x)=y
148 x5(y)=x
149 y5(x)=y
150 :
151 DEF PROCdraw(x,y)
152 CLS
153 GCOL 0,7
154 FOR I=0 TO n
155 x=a(i,0)
156 y=a(i,1)
157 IF I=0 MOVE x,y ELSE DRAW x,y
158 NEXT
159 GCOL 3,2
160 MOVE x(1),y(1)
161 DRAW x(2),y(2)
162 DRAW x(3),y(3)
163 DRAW x(4),y(4)
164 DRAW x(1),y(1)
165 WAIT
166 SYS 6,113,bank
167 SYS 6,112,3-bank
168 bank=3-bank
169 ENDPROC
170 :
171 DEF PROCdistort(x,y)
172 FOR I=0 TO n
173 x=a(i,0)
174 y=a(i,1)
175 IF (x-y)<0 THEN
176 x=x+(y-x)/(y-hi-ylo)
177 y=y+(x-y)/(x-hi-ylo)
178 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
179 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
180 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
181 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
182 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
183 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
184 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
185 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
186 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
187 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
188 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
189 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
190 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
191 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
192 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
193 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
194 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
195 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
196 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
197 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
198 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
199 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
200 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
201 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
202 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
203 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
204 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
205 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
206 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
207 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
208 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
209 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
210 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
211 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
212 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
213 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
214 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
215 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
216 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
217 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
218 x=x+(x-y)*(x2-x)-(y-x)*(y2-y)
219 y=y+(x-y)*(y2-y)-(x-x)*(y-y)
220 PROCdistort(x,y2)
221 PROCdraw(x,y2)
222 ENDPROC

```

Listing 3

IMAGE PROCESSING

Listing 1

```

10 REM >Arm Programming
20 REM Print out all SWI numbers and
names
30 REM Jason O'Bryan
40 REM For Arc and A3000 only
50 REM (c) BAU Sep 1990
60 :
70 DIM code 300
80 FOR X=0 TO 3 STEP 3
90 PX=code
100 OPT X
110 MOV R4,#0 \ This
register contains the SWI number
120 :
130 .getswi \ we a
e interested in
140 MOV R0,R4 \ Move
r4 into r0 (as the SWI call
150 : \ requi
res the number to be in r0)
160 CMP RD,#8100000 \ Have
we reached SWI number $8100000
170 MOVEG PC,R14 \ If s
then exit (r14 contains old
180 : \ value

```

```

of program counter)
190 ADR R1,buffer \ Address
ss of buffer for string
200 ADR R6,bad1 \ Point
er to a SWI name not to print
210 ADR R7,bad2 \ As above
ove
220 MOV R2,#50 \ Max
um space in buffer
230 SWI "OS_SWINumberToString" \ Convert
rt SWI number to string
240 MOV R5,#0
250 LDRB R8,[R1,R5] \ Get
he first byte of the string
260 CMP R8,#ASC"X" \ Is it
an X?
270 ADDNE R6,R6,#1 \ If No
t then ignore first character
280 :
e SWI not to print \ Check
290 .check1 \ if SWI name is the same as
300 : \ User
which we don't want to print

```

```

310 LDRB R8,[R6,R5]
320 LDRB R9,[R1,R5]
330 CMP R8,R9
whether characters of SWI
340 :
and bad string match
350 ADDEO R5,R5,#1
360 BNE chk
t then get on and print
370 CMPEQ R8,#0
e at end of string?
380 BNE check1
t then go around again
390 ADDEO R4,R4,#64
, then ignore the whole chunk
400 BEQ getswi
410 :
420 chk
430 MOV R5,#0
ar to check1
440 LDRB RB,[R1,R5]
450 CMP RB,#ASC"X"
460 ADDNE R7,R7,#1
470 :

```

```

480 .check2
490 LDRB R8,[R7,R5]
500 LDRB R9,[R1,R5]
510 CMP R8,R9
520 ADDEQ R5,R5,#1
530 BNE chk2
540 CMPEQ R8,#0
550 BNE check2
560 ADDEQ R4,R4,#1
his time if the two strings \ but t
570 :
then just ignore this one \ match
580 BEQ getswi
590 :
600 .chk2 \ Now p
rint out information \ Point
610 ADR R1,numberbuff
er to another buffer \ Point
620 MOV R2,#8
630 SWI "OS_ConvertHex6" \ Conve
rt SWI number to hex \ and p
640 SWI "OS_Write0"
print

```

Continued ▶

YELLOW PAGES

IMAGE PROCESSING

◀ Continued

```

650 SWI 256+32          \ a spa      680 SWI "OS_NewLine"          \ a new      710 :          760 .numberbuff EQU STRING$(8, " ")
ce (256+character number)  \ point      690 ADD R4,R4,#1          \ incre      720 .bad1 EQU "XUser"          770 .buffer EQU STRING$(50, " ")
660 ADR R0,buffer        \ and p      700 B getswi          \ ... a      730 EQU 0          780 JNEXT
er to SWI name buffer    nd around again          740 .bad2 EQU "XOS_Undefined"          790 CALL code
670 SWI "OS_Write0"
rint

```

Listing 1

```

10 REM Image processing #4
20 REM Interpolation
30 REM by David Knell
40 REM for all Acorn machines
50 REM (c) BAU September 1990
60 :
70 MODE 1
80 DIM world%4,4)
90 REPEAT
100 CLS
110 X_off=RND(1)/2
120 Y_off=RND(1)/2
130 thresh%#4
140 PROCplaceobject(x_off,y_off)
150 PROChowobject(x_off,y_off)
160 PRINT TAB(0,29) "Area by straight
thresholding is ";FNstraightarea(thresh%
)
170 PRINT "Area by interpolation is ";
FN interpolate(thresh%)
180 PRINT "Press a key to do again; q
to finish";
190 AS=GETS
200 UNTIL AS="Q" OR AS="q"
210 END
220 :
230 REM This procedure places a 2x2 sq
uare of grey level 99 in
240 REM the centre of our 5x5 "world".
X and Y offsets (in the range 0-0.5)
250 REM may be specified.
260 :
270 DEF PROCplaceobject(x_off,y_off)
280 LOCAL x%,y%
290 FOR x%#0 TO 4
300 FOR y%#0 TO 4
310 world%(x%,y%)=0
320 NEXT y%
330 NEXT x%
340 :
350 world%(1,1)=99*(1-x_off)*(1-y_off)
360 world%(2,1)=99*(1-y_off)
370 world%(3,1)=99*x_off*(1-y_off)
380 world%(1,2)=99*(1-x_off)
390 world%(2,2)=99
400 world%(3,2)=99*x_off
410 world%(1,3)=99*(1-x_off)*y_off
420 world%(2,3)=99*y_off
430 world%(3,3)=99*x_off*y_off
440 ENDPROC
450 :
460 REM Draw the object over a pixel g
rid
470 :
480 DEF PROChowobject(x_off,y_off)
490 LOCAL x%,y%
500 GCOL 0,3
510 FOR x%#0 TO 5
520 MOVE 100+100*x%,100
530 DRAW 100+100*x%,600
540 MOVE 100,100+100*x%
550 DRAW 600,100+100*x%
560 NEXT x%
570 :
580 GCOL 1,1
590 MOVE 200+100*x_off,200+100*y_off
600 MOVE 400+100*x_off,200+100*y_off
610 PLOT 85,200+100*x_off,400+100*y_of
f
620 PLOT 85,400+100*x_off,400+100*y_of
f

```

```

630 VDU 5
640 GCOL 1,3
650 FOR x%#0 TO 4
660 FOR y%#0 TO 4
670 MOVE 128+100*x%, 165+100*y%
680 PRINT ;world%(x%, y%)
690 NEXT y%
700 NEXT x%
710 VDU 4
720 ENDPROC
730 :
740 REM Calculate the area of the obje
ct without interpolation
750 :
760 DEF FNstraightarea(thresh%)
770 LOCAL x%,y%,area%
780 area%#0
790 FOR x%#0 TO 4
800 FOR y%#0 TO 4
810 IF world%(x%,y%)>thresh% THEN area
%#area%+1
820 NEXT y%
830 NEXT x%
840 =area%
850 :
860 REM Calculate the area of the obje
ct with interpolation
870 :
880 DEF FN interpolate(thresh%)
890 LOCAL x%,y%,xx,yy,w1,w2,area%
900 GCOL 0,2
910 area%#0
920 FOR x%#0 TO 3
930 FOR y%#0 TO 3
940 FOR x%#0 TO 0.99 STEP 0.2
950 w1=world%(x%,y%)*(1-x)+world%(x%+1,y%)*x
960 w2=world%(x%,y%+1)*(1-x)+world%(x%+1,y%+1)*x
970 FOR y%#0 TO 0.99 STEP 0.2
980 IF (w1*(1-y)+w2*x)>thresh% THEN
area%#area%+1/25:PLOT69,150+(xx+y%)*100,150
+yy*100
990 NEXT y%
1000 NEXT x%
1010 NEXT y%
1020 NEXT x%
1030 =area

```

Listing 2

```

10 REM Image Processing # 4
20 REM Charactor recognition
30 REM by David Knell
40 REM for all Acorn machines
50 REM (c) BAU September 1990
60 :
70 MODE 1
80 PROCsetuptemplates
90 PRINT TAB(0, 10) "THIS IS TEXT FOR
THE RECOGNISER"
100 PROCrecognise
110 END
120 :
130 REM Set up templates - just print
A-Z across the top of the screen,
140 REM from where the recogniser can
read the patterns.
150 :
160 DEF PROCsetuptemplates

```

```

170 PRINTTAB(0,0) "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
180 ENDPROC
190 :
200 REM Recognise a character, by pixe
l-by-pixel comparison and keeping a
210 REM score for each template
220 :
230 FNrecognisechar(x%,y%)
240 LOCAL ch%,tx%,ty%,xx%,yy%,minerr%,
minch$,err%
250 minerr%#100000
260 FOR ch%#0 TO 26
270 ty%#992
280 tx%#ch%#32:REM Find template chara
cter
290 :
300 err%#0
310 FOR xx%#0 TO 28 STEP 4
320 FOR yy%#0 TO 28 STEP 4
330 err%#err%-(POINT(tx%+xx%,ty%+yy%)<
>POINT(xx%,yy%))
340 NEXT yy%
350 NEXT xx%
360 :
370 PRINT TAB(0, 13) "Char ";CHR$(ch%+
65);" err ";err%;" "
380 IF err%#minerr% THEN minerr%#err%:
minch$#CHR$(ch%#65)
390 IF minch$#CHR$(65+26) THEN minch$=
" "
400 PRINT TAB(0, 14) "Best match so fa
r: ";minch$
410 NEXT ch%
420 =minch$
430 :
440 REM Recognise the whole line of te
xt, and attempt to reproduce it undernea
th
450 REM itself.
460 :
470 DEF PROCrecognise
480 FOR i%#0 TO 39
490 chs#FNrecognisechar(i%#32,672)
500 PRINT TAB(1,11)chs
510 NEXT i%
520 ENDPROC

```

Listing 3

```

10 REM Image processing #4
20 REM Listing 3
30 REM Label detecting
40 REM by David Knell
50 REM for all Acorn machines
60 REM (c) BAU September 1990
70 :
80 REPEAT
90 MODE 1
100 QX=830
110 PROCdrawbottle
120 x_off=RND(1)*40-20
130 y_off=RND(1)*40-20
140 rot=RND(1)*20-10
150 PROCdrawlabel(x_off,y_off,PI*rot/1
80)
160 PRINT TAB(0,0) "Offset x: ";x_off;
" y: ";y_off;" Rotation ";rot
170 :

```

AMPLE LISTING

```

"RUN" [] "cur?" [] "footer" []
"keyout" [] "lr" [] "wait" []
"switchstate" []
"RUN" [Footer MENUDISP
% 'Ample Album' Auto Selection
% Xtitle1 % "title1" lr
Xtitle2 % "title2" lr
Xtitle3 % "title3" lr
Xtitle4 % "title4" lr
MENU
] "cur?" [ 0 134 &FFF4 CODE #2 #B12 &FF AND
] "keyout" [ 7 MODE
READY
1 PC wait cur?
REP( REP( OFF switchstate )UNTIL( #2
142 keyout IDLE
cur? #2121 #= )UNTIL( #12 #2 wait
)REP #2
REP( OFF switchstate )UNTIL( #2
143 keyout IDLE
cur? #2121 #= )UNTIL( #12 #2 wait
)REP #2
switchstate )UNTIL(
)REP #2 13 keyout
)P
23 FOR( NL )FOR DISPLAY
%Press switch or SHIFT key to select
] "lr" [
"RUN -w"jukebox"LOAD RUN" +
"LOAD"="w"REP(-1QKEYO 128 &FFF4 CODE#2
3AND#=NOT OR )UNTIL(IDLE)REP]" +
] "switchstate" [ -1 QKEYE % SHIFT key
0 128 &FFF4 CODE #2 3 AND % buttons
0 #= NOT
OR
] "wait" [ 200 REP( switchstate )UNTIL(
1 #- #11 0 #< )UNTIL( IDLE )REP #2
]

```

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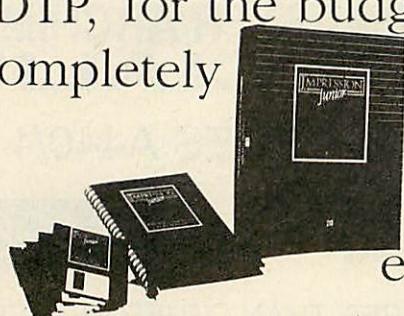
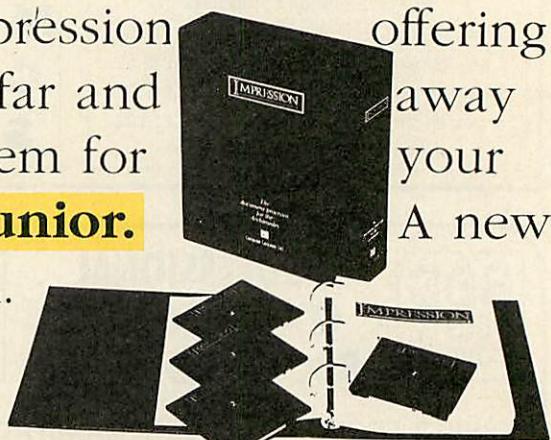
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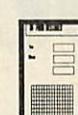
Government & Education orders welcome. How to Order: Enclose your cheque or P/Order made payable to CARE ELECTRONICS, Access or Visa welcome. Please allow 7 days for delivery.
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MEWsoft



The Friendly Software.



MEWsoft now has three packages to make the designing of Forms a much easier job:
The FORMS MANAGER is a non multitasking but very easy to use integrated forms designer package enabling the production of Forms in all sizes from Personal Organiser up to A4.

Prices inc p&p etc
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The FORMS DESIGNERS are RISCOS multitasking applications and come in two versions, one for A4 forms, the A4 FORM DESIGNER and one for Personal Organisers, the FAXFILE FORM DESIGNER.

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These packages are now used by many Schools and businesses to produce stylish mark sheets, assessment templates, worksheets, timetables etc.



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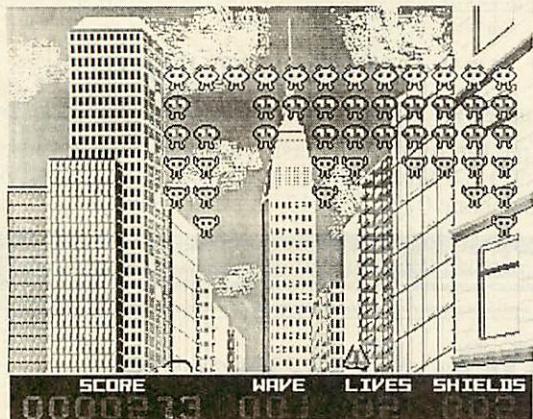


NEW

Alien Invasion

from Alien Images, the games division of
Dabs Press

You all know the classic invaders game, but Dabs Press brings you a totally customisable game for the world's fastest micro. You can create new types of invader and add different scenery - you can even insert your own!! With sampled sound throughout, speed control and over 1000 password protected waves, this is the best invaders game for the Arc.



PRICE £14.95

Psion LZ: A Users' Guide to OPL

The Psion Organiser hand held computer and its programming language - OPL, are now explained in full in our latest publication, by leading computer author, Ian Sinclair.

This book is a must for all dedicated Psion Organiser users and explains in detail how to get the best from the various built in utilities and programming language.

Topics covered include:

- Setting up the machine
- Stopwatch
- Notepad
- Variables
- Filing Techniques
- The PC Link

AVAILABLE NOW

PRICE £12.95

NEW

ArcDFS

DFS for the Archimedes/A3000

Now ready for *immediate* despatch ArcDFS is a full Archimedes implementation of the BBC DFS filing system, which allows you to read and write BBC-compatible discs on your Archimedes or A3000. The application will read, write, format, copy, delete, title and perform all other functions on 3.5" or 5.25" discs formatted in Acorn, Solidisk or Watford formats (single or double density). Density and format seeking is automatic.

All operations can be performed from the RISC OS desktop, with the DFS disc appearing on the icon bar in the normal way, and displaying its files in a window. Alternatively, the facilities are all available as 'star' commands. ArcDFS is fully compatible with the BBC 6502 emulator. Many additional features are built into the system such as the ability to set up virtual DFS drives on an ADFS hard or floppy disc, and a DFS ramdisc.

PRICE £29.95

ARCHIMEDES FIRST STEPS

Beginners Guide to the
Archimedes & BBC A3000

This book is the perfect introductory guide to the Archimedes, to guide you through the first few months of ownership, acting as an easy-to-read supplement to the User Guide.

The book describes in detail how to put the RISC OS Desktop to best use, and also documents the programs on the Applications Discs provided with the machine.

But the book also goes beyond this and describes the sort of software and hardware additions available to the Archimedes owner, and how to choose and install them.

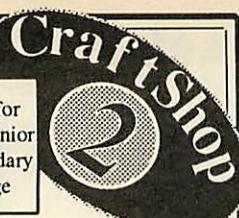
The many features of this book include:

- Applicable to all Archimedes with RISC OS
- Using the Desktop, RAMdisc and ADFS
- Edit, Paint, Draw and Maestro
- The Task Manager
- The BBC and PC emulators
- Hardware and software additions
- Illustrated throughout

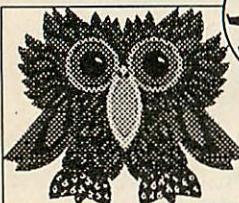
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Archimedes & A3000 Owners!

Quite a few Archimedes owners are apparently still unaware of *Archive Magazine* and the various services that Norwich Computer Services provide.

- **Archive Magazine**, now in its third year, provides vast quantities of information about Archimedes computers. (£17 for 12 issues each approx 60 pages A5.)
- **Archive Bulletin Board** keeps you in touch, on a day-to-day basis, with what is happening in the world of Archimedes. Part of it is open for public access, so give it a call on 0603-745932, scrolling, 8n1, up to 2400, 3 lines.
- **Archive Shareware / Careware discs.** We have a range of over 30 discs of public domain software from various sources. Many of the discs contain several quite substantial programs for as little as £3.50 per disc.
- **Members' Discounts** (up to 15% or more) are available on both software and hardware. A single purchase of a £150's worth of software or hardware could save you the complete cost of a year's subscription to Archive Magazine.

If you would like more details please let us know by letter, phone or fax.

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READER OFFERS

OFFER OF THE MONTH

LAST FEW
REMAINING

THE FANFARE FIVE-LANGUAGE POCKET TRANSLATOR

The essential travelling companion.

Superbly styled and easy-to-use, the Translator contains over 7,000 words across five languages.

Just type in the word you need and the Translator gives you an immediate translation at the touch of a button. In fact it's so versatile it will even translate from any of its built-in languages to any other.

Wherever you are in England, France, Germany, Italy or Spain, the Translator is instantly at your call helping you to ask for directions, read road maps, the daily paper or restaurant menus, find out what shows or other events are on (and when and where) and, of course, whether for leisure or business it will help you build up your own European language vocabulary.

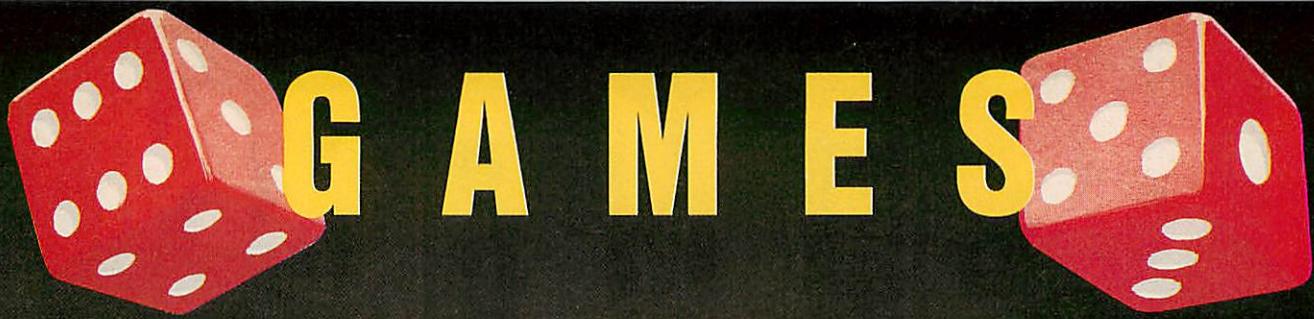
Measuring just 5 x 2.5 x 6.5 inches the Translator slips neatly into any pocket and comes with its own weather-resistant plastic cover.

If you're holidaying on the continent this summer, or ever go there for business trips, for just £29.95 (saving £5 off the RRP) you'll find the Translator an invaluable aid. But please hurry, as with many of our best offers we unfortunately must set a time limit, and can only guarantee availability until Friday August 31st 1990.

The Translator uses four AAA size batteries (not included).



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games

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Sam3 — Commando, Place of Magic, Killer Gorilla, Killer Gorilla 2

Sam4 — Frak, Spellbinder, Cosmic Camouflage, Grand Prix Construction Set (BBC), Guardian (Electron)

Sam5 — Imogen, Elixir, Bug Blaster, Fortress (BBC), Moonraider (Electron)

Sam6 — Galaforce 2, Hunchback, Hopper, The Sentinel (BBC), Video's Revenge (Electron)

Sam7 — Firetrack, Bonecruncher, Snapper, Ghouls

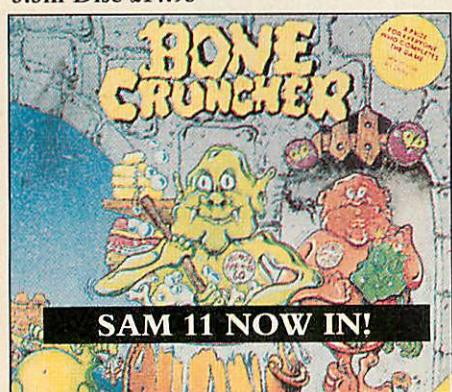
Sam8 — Winter Olympiad 88, Quest, Around The World In 40 Screens, Mr. Wiz

Sam9 — Camelot, Steve Davies Snooker, Spycat, The Life Of Repton

Sam10 — Repton Thru Time, 3D Dotty, Zalaga, Qwak

Sam11 — Barbarian, Pipeline, Baron, Monsters

Cassette £9.95, 5.25in Disc £11.95, 3.5in Disc £14.95



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Play TV's most popular sports quiz, for less than half price!

With David Coleman asking the questions and Ian Botham and Bill Beaumont heading up the teams, you can pit your wits against your family and friends, or even challenge your BBC micro.

There are six exciting and fast-moving rounds, including Pictureboard, Mystery Personality and a Quickfire round.

If you've always fancied yourself as a bit of a sports fanatic, this is the program that will thoroughly test your knowledge.

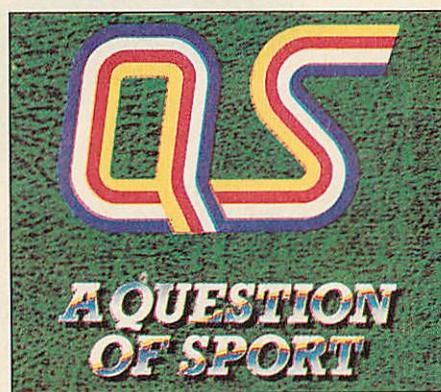
Order your copy today and see if you can beat the professionals at their own game.

Tape 5.25in 3.5in

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The computer version of *Trivial Pursuit* is faithful to the original board game. The object being to travel around the board answering questions and trying to collect a wedge for each of the six subjects.

The questions are asked by a cute character called TP, while the screen layout shows the board along with the progress of each player.

Don't worry about running out of questions. There are enough in this set to keep you wracking your brains through many sessions.

And for as little as £14.95 we'll send you the complete set of Trivial Pursuit games, including Genus, Baby Boomer and Young Players.

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ARCHIMEDES

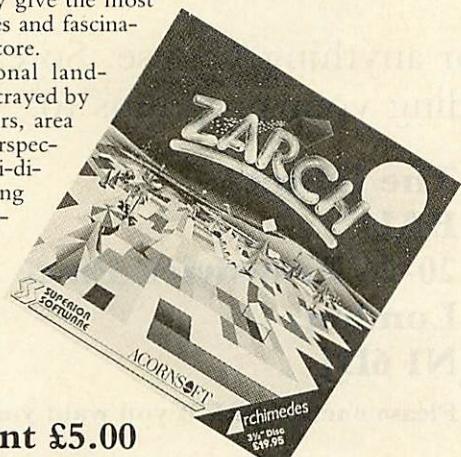
ZARCH

David Braben, author of *Zarch*, is also the co-author of the unanimously acclaimed game *Elite* – probably the world's highest selling computer game.

After months of program development work, David finally harnessed the speed and performance of the Archimedes computer to create another programming masterpiece.

Zarch is unlike any game you have ever seen before. Even the demonstration program, *Lander*, supplied on the Archimedes Welcome disc, can only give the most basic idea of the features and fascination that *Zarch* has in store.

The three-dimensional landscape is realistically portrayed by skilful use of 256 colours, area shading and accurate perspective design. The multi-directional smooth-scrolling movement is also enhanced by the use of twin screens: one is viewed while the other is updated.



RRP £19.95
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BBC MICRO / MASTER / ELECTRON

RICOCHE

Ricochet has an amazing 330 different action-packed screens arranged over five levels. You get five games in one, since each level has its own distinctive theme, with superb graphics and unusual puzzles to solve.

You control SPRAT, the Small Partially Robot Alien Time-traveller, in his quest to collect the five hour-glasses from the five worlds of *Ricochet*.

SPRAT can roll left and right and up and down ladders and ropes, but his unique ability is that he can jump to different heights and in different directions. You have to control the fast-moving alien as he ricochets through the levels.



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BAU Discount £2.00
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BAU Discount £3.00
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Cassette 5.25 in disc ADFS disc
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REPTON 3

The Repton series of games is the most successful software ever published for the BBC micro and Electron computers and has been described as 'The thinking man's arcade game'.

Now, a massive enhanced version is available for the Archimedes, comprising four complete games:

* REPTON 3 * THE LIFE OF REPTON * AROUND THE WORLD IN 40 SCREENS * REPTON THRU TIME

Enhanced features include a choice of four tunes and a position save/recall facility. In addition the software includes a sophisticated Screen Editor and Character Editor with a choice of 16 colours from a total of 4,096 hues. Plus you can design new screens and immediately test them by entering the game section.



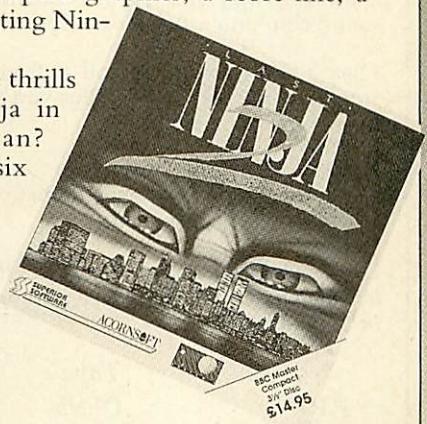
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LAST NINJA 2

Born in a time of peace, lived in a time of war, the shadow warrior returns. Leaping the abyss of time he comes to fulfil his destiny!

If you enjoyed *The Last Ninja* you'll go crazy over *Last Ninja 2*. There are lots more fiendish adversaries, more colourful screens with superb graphics, a score line, a timer and lots more exciting Ninja action.

Are you ready for the thrills and skills of the Ninja in crime-filled Manhattan? Can you survive the six action-packed levels?



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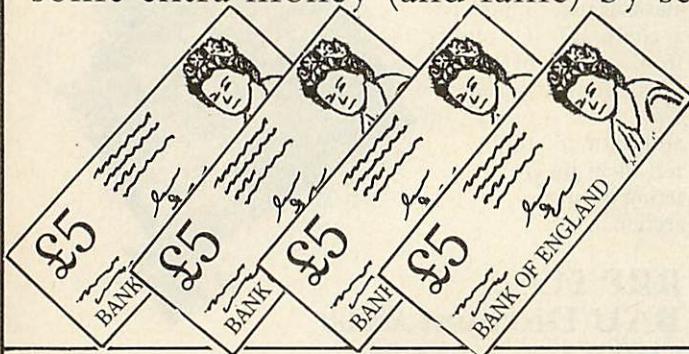
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Once installed you can call it from your own programs with simple-to-use commands. Plus you can fully configure it to speak in any accent or pitch.

And you can teach it how to pronounce unusual words and phrases — adding them to the built-in dictionary — customising *Speech!* to your own requirements.

Due to a bulk purchase we can offer this unique program to you for less than half price. But place your order soon as they're sure to be in high demand.

	Tape	5.25in	3.5in
RRP	£9.95	£11.95	£14.95
BAU Discount	£5	£6	£7.50
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Please note: *Speech!* is not compatible with the Electron

The program is not supplied in its original packaging but is complete and fully working.

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For a limited period we are offering *The Publisher* PLUS four extra discs giving a total of 86 different fonts for only £49.95!

The Publisher is a remarkably easy to use and powerful desktop publishing package, featuring its own page description language, allowing you to operate it from within *Wordwise*, *Wordwise Plus*, *View*, *Interword* or *Wordpower*, and giving you total control over the layout of your documents.

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Combined with the 86 fonts, *The Publisher* offers you everything you need to produce professional-looking results — all in one package, and for less than £50!

But remember, this is a limited offer, so to be sure of your *Publisher* kit order your copy soon.

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We have secured exclusive rights to offer the last few remaining Tandy FP215 Flatbed Plotters at an incredible saving of £400!

We can do this because, although they are superb pieces of equipment, there are only 80 of them left. This offer is therefore on a strictly first come, first served basis.

If you wish to order yours over the phone, or reserve one prior to ordering by post, please call our mail order hotline on: 0672 40825.

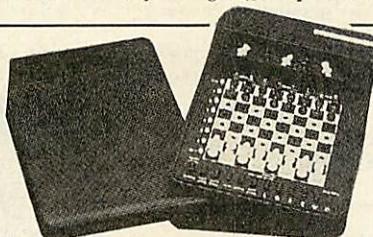
Remember this is the last time this offer will appear.

Save over 20% on the unique folding Microdiary

Specially designed so that it fits easily in your pocket or wallet, but opens out to give two manageable sets of keys and a two-line display, the 20k Microdiary is the ideal way to keep your important information instantly to hand.

Forget about paper personal organisers, the Microdiary has no trouble holding even the busiest person's contact list, as well as appointments, reminders, memos and much, much more — and you don't need a pen, or have to buy refill packs of paper each year!

And the best news of all is that for a limited period we have reduced the price of this unique device by £10. For just £39.95 you'll have one of the easiest, cheapest and most secure means of managing your personal data.



If you can't make up a bridge foursome, try the Dual Screen Bridge Computer

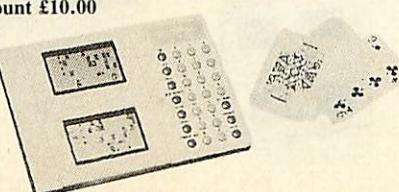
Only slightly larger than a paperback book, yet featuring 28 keys and two displays, the Dual Screen Bridge Computer is the ideal way for you to practice bridge.

Targeted at beginners to intermediate players it will help you improve your skills of bidding, playing and recall. While, if you are an advanced bridge player, the Bridge Computer will help you to keep your hand in. *And for just £49.95, saving £10 off the recommended price, you're sure to find it helps your bridge playing to improve — as well as being a fun pastime you can play anywhere.*

- * 4 levels of play
- * Plays 3 hands
- * Random cards generated for each hand
- * You bid against the computer
- * You can be dummy, declarer or defender
- * Checks for and disallows illegal play
- * Displays your cards, the dummy's hand, bidding, playing and vulnerability, and the results of contracts and tricks

RRP £59.95 BAU Discount £10.00

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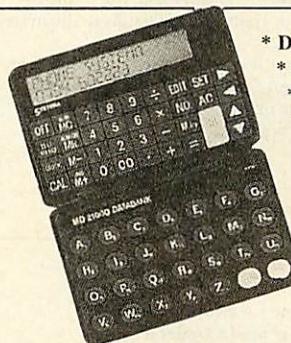
Specifications

- ★ Built-in parallel and serial interfaces
- ★ Easy connection to most computers
- ★ Comprehensive instruction set
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- ★ Full A4 size plotting area
- ★ High quality hard copy for reports
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**LAST FEW
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Offer Price £299



- * Daily, weekly, monthly and yearly reminder
- * 21 definable function keys for quick access
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- * Paperless "printer" for reviewing entries
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- * 24 World time zones
- * Memo function
- * 20k memory

RRP £49.95 BAU Discount £10.00
Offer price £39.95

The go-anywhere Pocket Chess Plus Computer

This is a truly pocket sized chess computer featuring a touch sensitive board so you can forget about entering fiddly coordinates because the Pocket Plus knows where you move each piece.

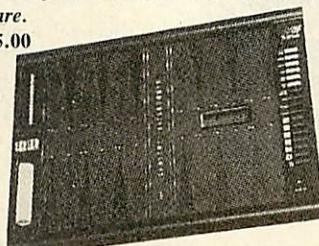
It comes with a comprehensive coaching facility which teaches tactical manoeuvres, warns you if a piece is in danger and even shows you its thinking.

Programmed with several difficulty levels, whether you are a beginner or a master, the Pocket Plus will give you a challenging game — every time. And it even remembers the state of play when you switch it off.

Normally the Pocket Plus sells for £34.95, but if you buy it from us we'll knock £5 off the recommended price. For just £29.95 you're guaranteed hours of enjoyment — where ever you are.

RRP £34.95 BAU Discount £5.00

Offer Price £29.95



Save £15 on the Saitek Sensory Backgammon Computer

This is a superbly presented portable or table-top backgammon computer which, like the chess computer, has a touch sensitive board so that it knows where you move the pieces.

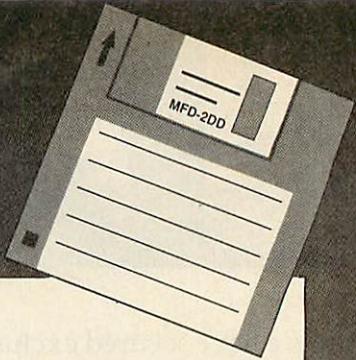
It features 9 levels of play with a quick response program and a fully automatic random dice display. And if you don't want to play the computer you can use the board to play a friend too.

Recommended at £69.95, we have slashed £15 off the price of this superb product. Order yours today for only £54.95.

RRP £69.95 BAU Discount £15.00

Offer Price £54.95

MASTER COMPACT



Brian Clough's Football Fortunes

Brian Clough's Football Fortunes is a football management game with a big difference. In an exciting departure from earlier simulation games it combines an excellent range of computer based features with a fascinating board game. Can you compete with human and computer managers to successfully steer your team through the season, using your skill to make it stronger as you proceed? With the program you get a large playing board, over 100 player cards, stacks of money, some counters and a comprehensive instruction manual. And for only £7.99 you're guaranteed hours of inexpensive yet intense, action-packed excitement!

RRP £9.99
BAU Discount £2.00
Offer Price £7.99



Colossus 4 Bridge

Colossus Bridge allows one player to play a complete game of bridge with the computer controlling the other three hands. Each hand is bid according to the Acol system, while other standard conventions are also available. If you're a beginner at bridge you can make use of the in-built tutor which has 10 specially chosen hands to illustrate the principles of the game. In fact, for just £10.99, whether you're a beginner or a more advanced player, you'll find Colossus Bridge is the ideal partner, either for practise or when you can't get another three people together for a game.

RRP £14.99
BAU Discount £4.00
Offer Price £10.99

Tank Attack

Tank Attack is a computerised board game for two, three or four players, where each player takes the role of a General commanding a country's Tank Corps of one or more armoured divisions. Your objective is to capture the enemy headquarters, which will require the planned strategic deployment of your forces and regular fire duels between your own and enemy units. Weather, morale, skill, judgement, planning, foresight, careful management of rebuild and repair facilities and luck all play a part in deciding the result of each game.

RRP £14.99
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Offer Price £10.99



Birdie Barrage Golf

An excellent golf simulation offering you the chance to play at the famous Turnberry Ailsa, Belfry Brabazon, Carnoustie Championship and Acorn Park golf courses. All the features you'd expect from a good golf game are here, including woods, water and bunkers. And for just £7.99 this must be a game that should be in everyone's collection.

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BAU Discount £2.00
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Blue Ribbon Disc 1

Five superb games on one disc:

- ★ Ravage
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- ★ Darts
- ★ Diamond Mine
- ★ Screwball

RRP £9.99 BAU
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Blue Ribbon Disc 2

Another excellent compilation of five action-packed games:

- ★ Astro Plumber
- ★ Joey
- ★ Diamond Mine II
- ★ Castle Assault
- ★ Bar Billiards

RRP £9.99
BAU Discount £2.00
Offer Price £7.99

Colossus 4 Chess

Probably the most complete chess program available for any home computer and written using the very latest techniques, by a computer chess programmer with over eight years experience.

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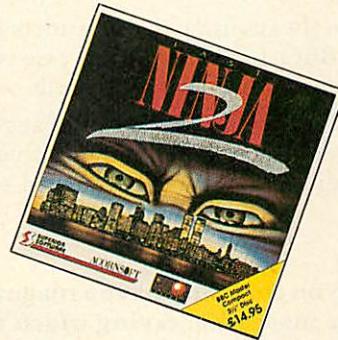
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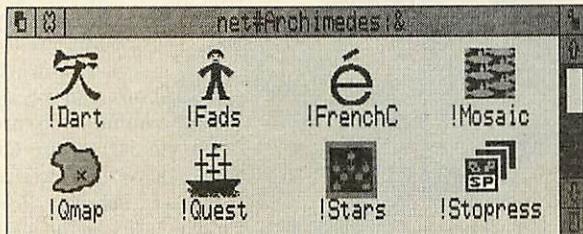
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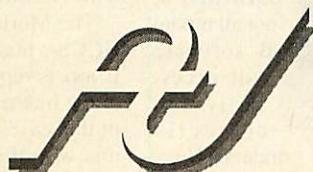


The best-selling BBC Micro software from the Advisory Unit has now been made available for the Archimedes and A3000. The software has been converted to run in native mode, not under emulation, yet every effort has been taken to ensure that they remain as faithful as possible to the BBC versions.

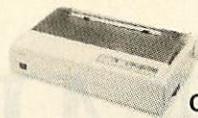
The titles now available for Archimedes are: Stopress £30, Qmap £30, Mosaic £25, Fads £25, Dart £15, Stars £12, Hex £12. A greatly enhanced version of Quest, offering many new features over the BBC Micro version is also available at £30.

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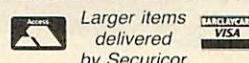
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AUGMENTING THE ARC

One of the delights of being an A3000 owner is that the system can be expanded in a number of ways to suit the user's specific requirements. This feature, embodied in the aged model B, was undoubtedly responsible for its undying popularity. Acorn, sensibly realising this, designed the A3000 to encourage third party companies to provide additional bits and pieces to help the consumer to arrive at the specification they desire. A point has been reached where the A3000 can be expanded to include four floppy disc drives and a 20+Mb hard disc of up to 20Mb, up to 4Mb of Ram and user/analogue ports or user/MIDI ports. The February issue of *BAU* covered the A3K1, A3K2 and A3K3 add-ons (Pres), a hard disc upgrade (DA Computers) and disc interfaces (CJE Micros, DA Computers).

A second disc drive means good disc management. Furthermore, by choosing a 5.25in floppy drive, the user gains access to a vast amount of MS Dos software using the *PC Emulator* and access to existing BBC software via *65Host*.

Pres is a company that aims at providing a complete upgrade path for the A3000 (*BAU*, February 1990). Its A3K6 disc interface is a trouble-free means of connecting up to three additional 3.5in or 5.25in floppy drives to the A3000. The Pres interface also offers direct access to files stored on DFS discs. The disc interface is correctly buffered and mounts on the internal podule sockets.

All the sockets are repeated on top of the A3K6 and you enjoy the ability to add a Pres internal mini-podule (user port/1MHz bus and the like). A lead connects to the computer's disc interface while the internal 3.5in drive connects to the A3K6. The whole operation is quite quick and simple. The interface has a back plate which is secured in place of the A3000's blanking plate. Links on the interface offer further compatibility with certain makes of floppy drive and an addendum sheet provides

The mark of a classic computer is its expandability and, as **CHRIS DRAGE** finds, the A3000 seems set to follow the lead of the Beeb, Apple II and IBM PC

details on the various known quirks. After installation, all that remains to do is issue a

*CONFIGURE FLOPPIES 2 and reset the computer.

The software provided is supplied on Rom and controls the drive-

latch value and the stepping rate. The command *STATUS reveals the default values as DRIVELATCH 0 1 2 3 8. By altering the value, an external drive can be recognised as :0 thus permitting a model B-type SHIFT-BREAK autoboot. Both single (80 track) and double (40 track) stepping rates are available.

The drivelatch settings are stored in Cmos Ram, so are always selected on start up.

A further advantage of the Pres interface over its rivals is its ability to expand the on-board software. The A3K12 has additional software supplied on both Rom and disc which permits DFS discs to be read or written to and even allows protected DFS software to be run under the *65Host* emulator.

In short, A3K6 together with A3K12 effectively turns your A3000 into a model B. In addition, the disc contains *!DFSFiler*, a program which can for example, transfer *View/Viewsheet/Viewstore* files directly from DFS into *Pipedream*. The *65HostDFS* copes well with most protected discs. All the heavily protected Sherston and 4Mat 5.25in discs load and run without complaint, albeit a little slowly. Remember though that, even if it loads correctly with

65HostDFS, not all model B software will necessarily run correctly under *65Host*.

Finding software that will run is a matter of trial and error.

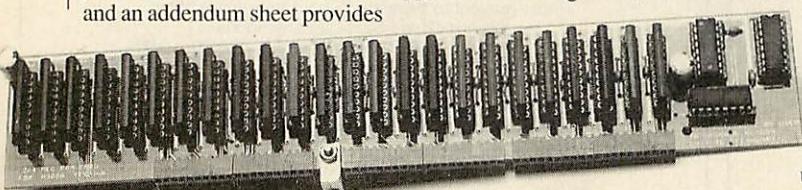
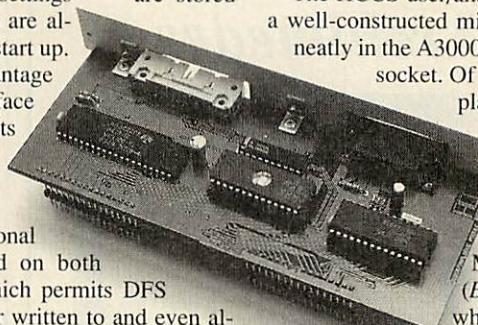
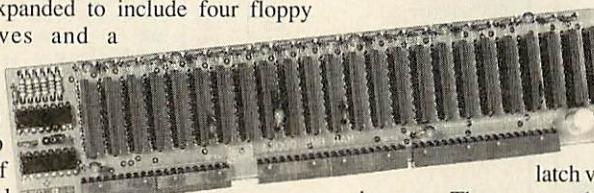
Many schools, including those catering for special educational needs, will be interested in adding a user or analogue port to their A3000s. The user port is essential for input devices like Concept Keyboards and switch units (for special needs) and buffer boxes (for control technology).

The analogue port will become increasingly important since the Technology National Curriculum (AT 5) emphasises so much data logging and monitoring work. Two companies that are currently offering a combination of these important model B-style ports are HCCS Associates and Morley Electronics.

The HCCS user/analogue port podule is a well-constructed mini-podule which fits neatly in the A3000's internal expansion socket. Of necessity, it will displace any disc interface residing in that socket; however, both can be accommodated providing you use CJE Micros' disc interface (*BAU*, February 1990) which sits on the motherboard's IDC disc socket.

The port's pin connections are identical with those on the model B and Master 128 and respond according to Acorn's specification for the earlier computers. However, the actual analogue connector is an Archimedes' 15-pin, I/O podule type. Thus any eight-bit software 'legally' written in Basic should operate the ports in the same manner providing there is no direct memory addressing. It is important that the correct *FX/OSBYTE calls are used. Similarly, the analogue port accepts the usual ADVAL/OSBYTE commands.

The Morley card is virtually identical to HCCS's both physically and electronically. It, too, is very well engineered, fitting snugly in the internal expansion socket. However, in this case, the user port is more compatible with the Archimedes I/O podule than



the Beeb/Master equivalent. The analogue port is 100 percent compatible and, again, uses a 15-pin connector. The comments about programming the HCCS unit relate to the Morley card as well. In addition, this card supports a IIC bus connector primarily intended for the connection of existing and

future Morley products like teletext receivers. Any IIC device (such as a speech synthesiser) may be connected to this bus.

The accompanying handbook is a model of clarity, leaving no stone unturned. The extra versatility of this expansion card is reflected in its higher cost.

In common with the A410, the A3000's memory is designed to be upgraded. As a result there is no recourse to soldering, flying leads or specialised tools; it is a simple matter of plugging a Ram expansion board onto four SIL connectors on the motherboard.

But why add more Ram? Here are some of the major advantages:

- High-level languages like C can be run.
- Faster printing can be achieved in graphics modes using Risc OS printer drivers.
- As large a font cache as necessary can be allocated (this leads to a speed advantage).
- Multiple applications can be run (for example *Pipedream*, *!Draw* and *Graphbox* together).

• A large Ram disc can be set up for storing outline fonts and so on. This considerably enhances the efficiency of DTP work.

• Huge documents can be held in Ram.

• Larger screen modes can be used.

Even with an additional 1Mb, you will notice a considerable difference, while a 4Mb card dramatically contributes to operational efficiency. Every Ram card adds to the original 1Mb of Ram supplied in each machine. Where they differ is chiefly in how extra Ram is added.

Some 1Mb cards need to be 'part exchanged' for a 3Mb model, while others will accept additional chips in order to expand the memory. There appear to be no hard and fast rules on that one. All of the cards come with a single sheet giving the fitting instructions.

The cards from Acorn, CJE Micros, Watford Electronics and Technomatic all use edge-mounted cards which fit vertically. CJE Micros' card offers a link to deselect the board ('removing' the 1Mb Ram) in order to run certain pieces of 'fussy'

software. To be fully effective you would need to add a flying lead as well as an external switch.

The CJE, Technomatic and Watford cards have spaces to accommodate the 3Mb upgrade (by adding soldered-in Ram chips plus components). The Watford card has an insulating strip to prevent the PCB from shorting out on the disc drive case and possesses a link to select either 1Mb or 3Mb of Ram, although this is not documented in any way. This four-layered board is cheaper than the competition (see June's advertised prices) yet is sturdy and well-built.

The card from Morley differs significantly in that it lies horizontally, is broader and has two plastic feet to ensure that the board is raised above the motherboard.

It is very well engineered but it needs to be further upgraded by the addition of Ram chips, although Morley is considering switching to a trade-in system of upgrading. The TechnoRam card is approximately 30mm longer than the other vertically mounted boards. It, too, is extremely well-built and possesses a

bracket and a thick protective insulating pad to ensure the board remains rigid and less likely to damage the motherboard should it be accidentally knocked about.

One thing all these Ram expansion cards do have in common is reliability. They are

all variations on a theme and your decision can be governed by price as much as anything. My favourites happen to be the TechnoRam and Morley cards.

All the Ram cards are very simple to fit, requiring nothing more than a small posidriver and a flat-bladed screwdriver together with a bit of care.

However, it is important to realise that by 'lifting the lid' you may invalidate Acorn's product warranty. If you are in any doubt at all about your situation it is advisable to approach an authorised dealer to perform the upgrade for you – although this may be at extra cost.

Pres Ltd, PO Box 319, Lightwater, Surrey GU18 5PW. Tel: (0276) 72046.

HCCS Associates Ltd, 575-583 Durham Road, Low Fell, Gateshead, Tyne & Wear NE9 5JJ. Tel: 091-487 0760.

Morley Electronics, Morley House, Off Norham Road, North Shields, Tyne & Wear NE29 7TY. Tel: 091-257 6355.

Acorn Computers Ltd, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Tel: (0223) 2452000

CJE Micros, 78 Brighton Road, Worthing, West Sussex BN11 2EN. Tel: (0903) 213361. Technomatic, Techno House, 468 Church Lane, London NW9 8UF. Tel: 081-205 9558.

Watford Electronics, Jessa House, 250 Lower High Street, Watford, WD1 2AN. Tel: (0923) 37774.

PRICES AND SUPPLIERS

Supplier	User/Analogue port module	1Mb Ram board	3Mb Ram board	A3K6	A3K12
	£	£	£	£	£
Pres	-	-	-	56.30	22.94
HCCS	51.75	-	-	-	-
Morley	79.35	113.85	-	-	-
Acorn	-	148.35	-	-	-
CJE	-	120.00	-	-	-
Technomatic	-	90.85	286.35	-	-
Watford	-	109.25	343.85	-	-

*These prices are, as far as we know, accurate at the time of going to press. However, such prices, particularly for Ram, fluctuate rapidly, so it's worth shopping around for the best deal.

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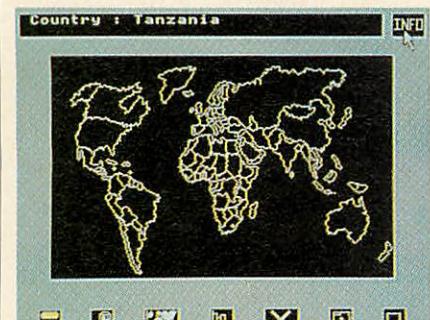


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It's not always easy to find detailed geographic and economic information to hand, and in today's ever-changing world, you may feel you need to. Help is at hand, though. With the publication of Owen Love's *World Map Study*, which is a graphical world database for the BBC micro, assistance is merely SHIFT-BREAK away. *World Map Study* provides a map-based world database for displaying and gathering geographical and environmental information. It contains information stored in 17 data categories for 127 individual countries. The data is as good and up-to-date as it can be, having been taken from *Global Statistics* produced by Brian Hudson and published by the Centre of Global Education in York.

World Map Study is extremely easy to use. It is not like most BBC databases as it uses the latest Windows, Icon, Mouse and Pointer (Wimp) environment. It is also graphics based, so by moving the pointer around the screen and clicking on any one of the 127 individual countries shown on a world map, the user can find statistics varying from the area of the country to its mortality rate within seconds. The way this



At your fingertips: 127 countries

program operates shows just how far software for the BBC micro has developed since 1982. But not every BBC user has a mouse, so the program can be run from the keyboard with the four cursor keys to simulate mouse movement. This is quite adequate but it can be speeded up by using SHIFT and a cursor key. Non-mousers have to use SPACE to do the clicking. Any user with an AMX Mouse Rom fitted into their BBC will have true mouse and pointer control.

Moving the on-screen pointer over any country and pressing SPACE will put the name of the country into the information box at the top of the screen.

Detailed information on that country is then obtained by moving the pointer to the Info icon at the top right of the screen and pressing SPACE.

The information provided covers: surface area; population; GNP per capita; military spending; armed forces; teachers; doctors; urban population; child population; life expectancy; mortality 1960; mortality 1981; male literacy; female literacy; and

A WORLD OF INFORMATION

DAVE FUTCHER investigates a new geographical database package that puts the whole planet at your fingertips

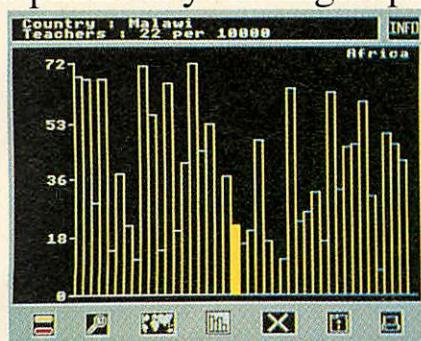
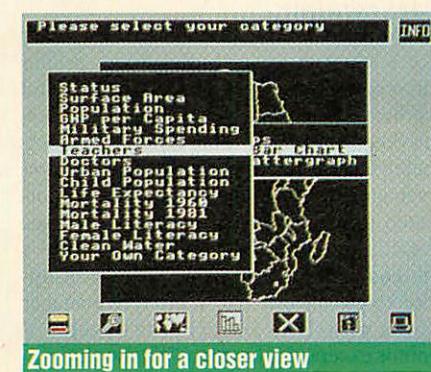
clean water. In addition the capital city is given and the country's status – whether it's developed or developing.

As well as displaying the world map it is possible to display maps of the individual continents, with the exception of Antarctica. This is particularly useful when trying to select some of the smaller countries in crowded continents. Continent displays are achieved by using the enlarge icon to zoom in on a particular continent.

The program provides very good opportunities for the interrogation of the stored data. Answering detailed questions about national statistics would be impossible without the interrogation and graphing facilities available. The program's real power is seen when comparisons are made across individual continents or the whole world.

To make this possible three types of data plotting are available. As well as the usual plotting of data on a bar chart or a scattergraph, data can be plotted on maps with countries coloured in to show, for instance, the average value of gross national product (GNP) per capita for those countries with figures more or less than \$8,000. The inclusion of the scattergraph option opens up all sorts of possibilities for the advanced use of the *World Map Study* package. Investigations can be made into such questions as how much longer people live in the richer countries, or the relationship between access to safe water and health.

It's all very well manipulating and displaying data on screen but, information at times is needed as hard copy. This presents no problem to *World Map Study*. If you have an Epson or compatible nine-pin dot matrix printer you can print any information you have on screen very easily. You merely take the pointer to the printer icon



Histograms make information clearer

and press SPACE and confirm that this is what you want to print by pressing P. The screen dump is fast and clear, but the program's manual omits to tell you to ensure the computer is set not to send linefeeds.

Data soon becomes out of date and programs like this could become limited in use. The author has thought of this and a means of amending or editing old data is provided. The potential of the program is further enhanced by the possibility of using your own data categories rather than those selected by the author.

Conclusions

As well as providing a database of global information, *World Map Study* is an ideal package for enhancing a number of general and information technology skills. It offers first-rate opportunities for database interrogation or the manipulation of graphical output from a database, as well as the interpretation of information on maps, bar charts and scattergraphs.

World Map Study comes with a very useful handbook that clearly explains how to use all the features of the program.

Although the program is simple to operate through its icons and pointer, this nonetheless makes all the features clearer. I particularly liked the worked examples. Additionally, the handbook includes a series of ideas for its use by pupils or students. Teachers will find this invaluable.

World Map Study will undoubtedly help pupils or any user to question and make hypotheses about today's world.

World Map Study is published by ESM Ltd, Duke Street, Wisbech, Cambs PE13 2AE. It is available for the BBC micro and Master series and costs £30.

There used to be two types of laser printer: the expensive laserjet and very expensive Postscript. Now 'direct drive' is here with the Calligraph ArcLaser and Computer Concepts' LaserDirect.

Every laser printer uses toner powder and a 'laser' to draw images onto a light-sensitive drum (like a photocopier drum); the difference is how the images are drawn.

With a normal laserjet printer, the Arc builds up a complete image of the page in Ram, a section at a time, then transfers the data for each section down the parallel cable to the printer. Each section is like a screen dump – it's a huge chunk of graphics data. The printer reads data from the computer very slowly, taking perhaps a couple of minutes to transfer all the sections. It stores the graphics data in the printer's own megabyte of Ram, gradually rebuilding the image of the whole page. When the image is complete, the printer starts up and reads the image data out of its own Ram very fast, drawing it onto the light-sensitive drum using the laser beam or LCD shutter in about five seconds. A pattern of static builds up on the drum, which then picks up the toner powder and offsets it onto the paper.

Postscript printers use a contrasting strategy. Rather than the Arc assembling the whole page, it transfers only the commands needed to draw the page – write some text here, draw a circle here and so on. The printer interprets the commands and draws the image into its Ram. The net result is the same, but only the drawing commands have to be transferred, not the whole graphics image, so Postscript printers are quicker.

The two new machines represent a third, and even quicker, class of printer: the direct drive laser printer.

Each is built around the same 'laser printer engine' – in fact it's the guts of a Qume Crystalprint that puts the black marks onto paper. The Qume uses a well-tried LCD shutter mechanism built by Casio, not a real laser. Instead of the printer being full of electronics to control the motor, heater, lamp and LCD shutter, it's all controlled directly from the Archimedes. There is just the bare minimum of circuitry in the printer, and the price advantage is clear.

With each machine, an interface podule is needed in the Arc to control the printer timing and data transfer, and there's a tiny matching board in the printer too.

These use the Arc to build up the image of the page in Ram, but whole – not in sections as with the laserjet. The special interface podule makes it possible to read the data out of the Archimedes' Ram and into the printer fast enough to control the laser or LCD shutter directly – the data isn't stored in the printer first. It's read at about two megabits per second, over a

THE THIRD WAVE

Can direct drive laser printing achieve the goal of more speed plus lower price? **GRAHAM BELL** investigates



Direct drive printer plus podule: the wave of the future?

hundred times faster than you can manage through the serial port. This gets rid of the main printing bottleneck that slows down laserjet printers – the printer cable itself.

Direct drive is also much faster than the Postscript method. The reason is threefold. First the Arm processor in the Arc is faster than the processor in most Postscript laser printers. Second, Postscript prints sprites by sending them as hexadecimal numbers in text form, so it doubles the length of all sprite data. Furthermore, you would normally have to download fonts that aren't built into your Postscript printer, which takes extra time.

Both direct drive printers are also faster for a separate reason – the Acorn printer drivers are very slow at rotating text and sprites from portrait to landscape. The new drivers do this much more efficiently. Computer Concepts has replaced Acorn's font manager with a faster version that's dedicated to assembling printer pages; it uses exactly the same font outlines, so there's no compatibility problem. There's an option to use the original Acorn font manager if you wish. Both printers, with a couple of minor exceptions are truly Wysiwyg.

The direct drive models must build up the whole page image in one go. This takes a lot of memory in the computer, up to 1Mb per page, but both systems compress the image and expand it again when sending to alleviate the problem. Even if you do need an extra megabyte (and neither printer is at all practicable with a bare 1Mb machine), it seems more sensible to have it in the Arc than to have it fitted to the printer where it's inaccessible.

Apart from raw speed, the direct drive printers share other features. As both are built around the Qume Crystalprint, they both carry with them the basic advantages and disadvantages of this machine.

It's a very compact, reliable and slightly noisy printer which produces good laser quality text, notably solid blacks – many laser printers 'fade' the middle of black areas just like photocopiers tend to do. And supplies like the toner and drum are a tad more expensive than some other laser printers; the running costs could be around 4p per page.

On these direct drive (and current Qume) machines, the Qume printer's normal inability to handle heavy paper or letterhead is

mitigated a little: a rear paper-feed for single sheets and envelopes is provided.

The software supplied with both printers means you can print from any application that uses the Risc OS printer drivers – but that rules out some important software. If you're a *First Word Plus* user, or you make use of either the Beeb or PC emulators, then direct drive is not for you. The only way to print anything is to spool your printout to a file, then print that as if it were an *!Edit* file when you return to the desktop – and that way you're limited to fairly plain text. Furthermore, if you write programs to access the fancier features of your printer using Escape codes – forget it! These are purely and simply Risc OS printers.

The Calligraph ArcLaser and Concepts' LaserDirect are two virtually identical products – although neither the podules nor the printers are interchangeable. They suffer similar problems and offer very similar benefits. So what are the differences?

Computer Concepts' LaserDirect

Concepts' LaserDirect consists of the printer itself, a podule that must be fitted to your Archimedes' backplane, cable, software and a manual. Setting it all up was simple – the Qume Crystalprint is one of the easier 'laser' printers to get going – though the shortness of the ribbon cable between the printer and podule meant the printer wouldn't go in its normal place. Computer Concepts will sell a longer, shielded cable if needed.

The PrinterLD driver software can be installed on the icon bar just like Acorn's own drivers and the software offers similar facilities to the Acorn version. Click Select over the printer icon and a dialogue box offers options like *Quick Text* (Computer Concepts' own *Font Manager* replacement) and a choice between landscape and portrait for plain text printing (from *!Edit*), plus a new option to control the font used for plain text files.

Remember, there are no typefaces built into the printer. While a laserjet uses the printer's own Courier text style, the LaserDirect has to use the Acorn outline Courier (Corpus) – or any other face you choose – to print plain text. The dialogue box uses Concepts' pretty 3D look, familiar to *Impression* users.

The printer menu offers conventional choices like printing to a file, as well as several special items like Show Drum Usage. This clever option flashes the number of pages the printer has printed so far on the printer display. And you can print a test page via the menu too. The printer is entirely software-controlled.

Once the software is installed, printing proceeds as with any other Risc OS printer driver. Select Print from a menu and out comes the paper. Whatever Archimedes printer you're used to, you'll be quite un-

prepared for the speed of the LaserDirect.

There are two phases to printing. First, an area of Ram is grabbed and the page image is assembled. Then the page is printed – all the data is taken from the Ram and sent from podule to printer in about four seconds. Because the second phase happens 'in the background', the second page can be assembled while the first is printing.

If you have enough Ram, a queue of assembled pages can build up; you get back control of your micro as soon as all the pages have been assembled, while the remainder are still waiting to print. In practice this rarely saves you any time unless you have an Arm 3 upgrade fitted.

During printing, there's plenty of feedback. Lights on the printer flash to show whether pages are being assembled or printed, and the printer display shows how many pages remain in the queue.

The table shows a comparison of times to print several typical jobs; a large sprite, a complex DTP document, simple landscape text and so on. The LaserDirect showed a clean pair of heels to the competition. A couple of minor bugs and inconsistencies showed up during the testing, but these were fixed by improved driver software delivered during the review.

Calligraph's ArcLaser

Setting up the ArcLaser is identical to the LaserDirect – simply installing the podule and plugging it all together, then copying the driver software onto your own disc.

Calligraph's interface podule is much simpler than the LaserDirect, so clever touches like Show Drum Usage are not available from a software command – you have to wait until the printer gives you a warning that the drum is approaching the end of its life.

But the PrinterAL software is functional: you can print to a file for later printing, or even to a sprite, and choose portrait or landscape for plain text printing.

As the table shows, the ArcLaser lags behind the LaserDirect, in part because both phases of printing, assembly and transmission, occur in the foreground. You don't get control back until all the pages are printed and there's no queue of unprinted pages. But it's still comfortably faster than

the conventional laser printers. The major drawback of the ArcLaser is that printing is strictly mono. There is no half-toning of sprites; you get greys in Draw files, but not from *!Paint*.

This is a severe restriction if you want the printer for desktop publishing, scanned pictures or any application where sprites are used. Improved driver software will cure this in the future – but this has to be contrasted with the LaserDirect which does good half-toning now.

Conclusion

Hitherto there has been an orderly trade-off between printer speed and price. Both of these machines smash that away by offering faster-than-Postscript speed for less-than-laserjet price.

There is no doubt that the LaserDirect is by far the more polished product of the pair. It works right now, it's slick, it's cheap, and it's fast. Very. If you're buying purely on speed, then this is a clear winner.

But if you're willing to forego a few frills for the moment, then the Calligraph ArcLaser – currently £200 cheaper – could be a steal. It doesn't quite bat in the major league yet due to the lack of half-toning, but improved software is being developed.

Both the LaserDirect and the ArcLaser are likely to appear in other versions, linked to different laser printer engines – for example the Canon LBP-4 – as each of the podules has been designed for easy revision. Computer Concepts includes a programmable gate array to handle the logic, Calligraph a tiny daughter board 'personality module', to make such changes easy.

The software for both these machines should develop. Printing over the network is one area that both companies are looking at. And as well as half-toning, Calligraph plans to include an Epson dot-matrix emulator in its software, which could open up the machine to *First Word Plus* or emulator fans. Buying either machine now won't cut you out, as software upgrades will be free.

Calligraph Ltd, 53 Panton Street, Cambridge CB2 1HL. Tel: (0223) 461123.
Computer Concepts Ltd, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933.

	Calligraph ArcLaser	Concepts LaserDirect	Concepts LaserDirect**	Typical Postscript	Typical LaserJet
Complex 3-page Impression document with pics	2:07	3:20	2:08	8:36	16:34
Quarter page sprite from Paint	0:21*	0:31	0:31	3:04	1:17
Simple 10-page DTP landscape document (no pics)	4:30	10:09	2:22	3:14	66:51
1000 word text from Edit and landscape	0:49	3:02	0:49	1:22	0:46
All times in Mins:secs					
**with fast text					
* no halftoning yet. Software upgrade promised soon					
Comparative analysis of the LaserDirect and ArcLaser					

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BUILDING UP THE BEEB

DAVE FUTCHER looks at a new expansion board – the answer to those memory-hungry Beeb PC programs

Ventura Publisher, which operates under Digital Research's GEM 3 interface, on the IBM PC or one of its compatibles is a useful DTP package. Although it lacks a true WYSIWYG interface and any internal wordprocessing facilities, it is used by some professionals, should they happen to be equipped with IBM PCs.

Ventura Publisher is in most ways outclassed by Mac or Amiga DTP packages, but they won't run on the Beeb. *Ventura* will – now. The package can run on a BBC Master or a BBC model B, as long as it has an 80186 co-processor fitted that has been upgraded with one of Essential Software's 512K memory expansion boards.

BBC Model B and Master 128 users have, since 1986, had the possibility of running a vast array of IBM PC software on their suitably upgraded 8-bit machines. This was achieved because of Acorn's foresight in designing and producing a 80186 co-processor (also known as the 512 board) as part of the Master computer series. Many BBC owners value the possibility of being able to stay with their BBC, without the need to upgrade to a 'real' PC.

Despite the compatibility of the Acorn 80186 co-processor board there have always been memory constraints running the 512 under the DOS Plus operating system.

This was partly because the memory needs of DOS Plus were 90K larger than Microsoft's MS DOS. There was also the problem that some applications needed as much as 640K running under MS DOS.

This is why Essential Software has produced an upgrade to the original Acorn 512K 80186 co-processor. Now a host of IBM PC software packages can run with ease on a humble BBC micro with the Essential Software expanded 80186 co-processor.

As already mentioned DR's GEM 3 will work with no difficulty at all, and that includes everything on the desktop. Version 1.01 of *Ventura Publisher* will work from two floppies with three fonts and provide BBC owners with a useful DTP capability. Industry-standard wordprocessors like version 5.0 of *Wordperfect* run, as does Microsoft's *Word*. The popular shareware package *PC Write* (version 3.1), which allows documents in excess of its original

64K, can cope with up to 400K of text in memory in an expanded 512.

Most versions of *Lotus 1-2-3* happily run on the 512, but with the expansion installed 1-2-3 will use the full memory left after loading DOS Plus. This is rather an exception as most software will not use in excess of 640K, even when it is available.

Earlier versions of Ashton Tate's *dBase* have operated on the original 512, but now the latest *dBase IV* can be used.

A real boon will be the possibility of running *AutoRoute* with on-screen maps and all; but the Tull mouse driver is essential.

In fact anything that was unable to run on the standard 512 because it needed more memory should now be able to run with ease. But don't expect Essential's upgrade to run programs that had been prevented from running on the 512 because of other problems like hardware addressing.

Whatever software you run on your expanded 80186 co-processor, the possibility of exploiting the additional Ram in other ways will be important. Essential Software has thought of this too, with the release of a specialised Ram disc program that enables you to use available expanded memory as a Ram disc.

Problem solver

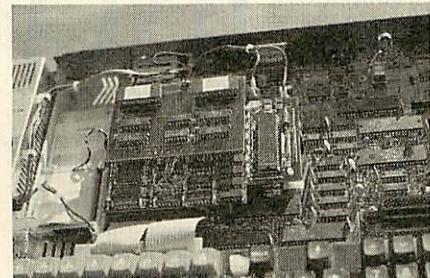
Shimbumi Software's *Problem Solver* is compatible with the expanded board, which means some of the tricky packages this package has helped before can continue to receive its support. The new board provides continuous Ram.

Essential Software's 512K memory expansion board is not a 'fit it yourself' piece of hardware like a Sideways Rom or Shadow Ram board.

You have to send your 512 board to Essential Software for the company's technicians to carry out the upgrade, as the fitting of the upgrade requires a number of soldered connections.

The expansion is supplied as a complete package, fitted, tested, and with re-programmed Eproms, without which you would lose 128K of the fitted memory.

But there is no need for you to be without your BBC for long. On receipt of a firm order, (including the cheque for £99.00), Essential advises when a 'slot' will be available for your installation. You then send



Essential's board has just four Ram chips

your original 512 board for the upgrade.

The expanded board arrives from Essential Software carefully packed. Once it's out of the wrappings you'll notice that an additional circuit board has been fitted near the centre of the original board above the area where the 80186 processor is located. The new board is actually linked into the main board by full pin connections to the sockets which contained the original ICs 31 and 32, which were control Eproms. The expansion board measures 110x73mm and it has been carefully placed within the external dimensions of the main board.

Surprisingly, the expansion board seems virtually empty of chips. It contains just eight, including the two replacement ICs (31 and 32); the remaining six include the very lastest 1Mbit Drams (four 256Kbit chips), plus two standard decoding chips.

The additional 512K of memory is provided by just four chips – the original 512K board needed 16 chips for the same amount of memory. Fewer chips cuts down power requirements and ensures no overheating.

When you first boot up your newly-expanded Beeb, you may be surprised by the sign-on message which announces 896K rather than the 1Mb you expected. The entire memory space is 1Mb, but the missing 128K is due to the way the 80186 CPU segments memory. In fact, two 64K segments are used for Rom and Tube hardware control.

Conclusions

In use the expanded board behaves just like the original 80186 co-processor, but with the benefit of the extra memory.

Full software packages can be run; there is no need to strip out so-called 'non-essential' parts of some programs to get them running on the 512. Where the 512 Memory Expansion really scores is when running memory-hungry packages like *Ventura Publisher* or *WordPerfect V5.0*.

The 512 Memory Expansion is manufactured by Essential Software, PO Box 5, Groby, Leicester, LE6 0ZB and it costs £99.

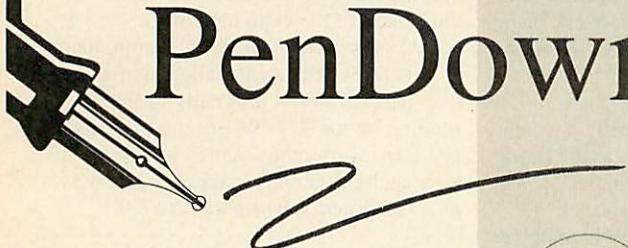
Ram disc utilities for the 512 Memory Expansion are also published by Essential and cost £16.95. Owners of the original package for a standard 512 can upgrade for £2 plus the return of the original disc.

Pendown is already a favourite writing tool in schools across the country. Now it has been completely redesigned to take full advantage of all the facilities that make the Archimedes (A3000) so popular. It features a powerful dictionary, thesaurus and spell checker, along with a friendly user-interface that can be reconfigured to make as much sense to a six-year-old as it does to an adult. Special fonts, simplified layouts and on-screen help make it perfect for the very young, whilst powerful word-processing features mean it is equally at home with students working on 'A' Level projects.

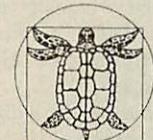
Longman Logotron has a wealth of experience in producing educational software, and also produces the National Curriculum standard Logotron Logo, Numerator – a revolutionary maths package, and Hyperbook

software and texts, all of which are available for the Acorn Archimedes. For a brochure and full details of all Longman Logotron's educational software, write – stating whether your interest is primary or secondary education – to the address below.

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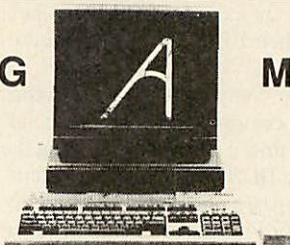
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COVER TO COVER

Our look at books for this month ranges from a study of the 'computer addict' to the opposite – encouraging children to communicate using micros

Computer Addiction? A study of computer dependency

Margaret Stott. Published by Taylor & Francis, 4 John Street, London WC1N 2ET. ISBN: 0850667968. Price £12.95.

There you are, sitting at your computer. It's time for dinner, nah, skip dinner. It's time for bed, nah, skip bed. If this describes your

evenings then you could be an addict – dependent on your micro.

This is an issue that Margaret Stott, while observing students with their computers at Loughborough University, thought should be given some serious consideration.

So, what type of person is the computer addict likely to be? Dependents are generally of a shy and introverted nature.

While they are no less ambitious or intelligent than their non-dependent counterparts, they generally feel the need to escape social interaction as far as possible.

The dependent computer user is much less likely to be concerned with an eventual output from their toil. The very thrill of spending hours at a computer is sufficient.

As you would expect, the majority of dependent users are male. Stott claims this is because women are more interested in the output. To them, the computer is a tool and is used as such. The end result is important – not the fiddling about.

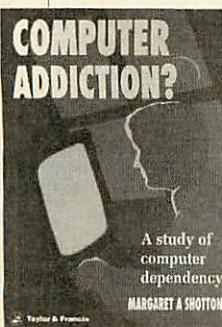
Stott identifies three categories of addict. Networkers use their computers to communicate with others via modems while workers, on the other hand, are more career obsessed and see the computer as a means of advancement.

By far the largest group of dependents, however, are the Explorers. These are the addicts who program willy-nilly with no concern for the eventual output.

In her conclusion, Stott asks if computer dependency is a serious problem for either the dependent or his/her friends and colleagues. She puts forward some interesting ideas, one of which is that as computers become more user-friendly the thrill will disappear and so too will the dependency.

For the moment though, it is amazing to see how much computers mean to some people. Why not read this book and see if you could be one of the addicted?

Pauline McLernon



Talking IT Through

Edited by Hilary Kemeny. Published by NCET, Sir William Lyons Road, Science Park, Coventry CV4 7EZ. ISBN: 1-85379-100-8. 80pp. Price: £5.50.

Talking IT Through is a collaborative publication from the National Oracy Project and the National Council for Educational Technology which focuses on the talk which takes place at and away from the classroom computer.

The bulk of the book consists of case studies, nine in all. These come from a variety of different areas of the curriculum, taking in maths, control technology, special needs and multilingual work.

The report on how computers were used in a nursery unit is particularly interesting. The teacher notes, 'The children were making sense of their experiences: talking about their knowledge, using it and making it their own... talking to a computer is a most public way of relating a story, but the children seem to see the experience as a private communication between themselves and the micro.' The observation that pupils find the computer 'neutral and unthreatening' crops up in many of the other contributions too.

Major features of the book are the transcripts of children's conversations at the computer. Although how speech is represented in text is a matter of some debate, these are fascinating and, of course, essential for the illustration of authors' points.

The software packages mentioned in the text will by and large be familiar to teachers. This is both a strength and a failing. For instance, while the description of the use of the ubiquitous *Granny's Garden* provides useful points of comparison for teachers' own experiences of the program, there are few suggestions about using newer packages which are likely to be effective talk generators.

Firmly labelled as a starting point, *Talking IT Through* does not provide definitive answers but it does raise a number of important issues and provides a valuable stimulus for discussion about the language opportunities offered by computers. It would be a worthwhile addition to any staffroom bookshelf.

Lisa Hughes



DTP at a glance...

Rob Pickering. Published by Bookmark Publishing, The Old School, Bedford MK45 5DE. ISBN 1-85550-002-7. 90pp. Price: £9.95

As desktop publishing becomes more popular, home users try hard to achieve a polished, professional look on paper. But it's all too easy to make your magazine or society newsletter look like a dog's breakfast.

Fortunately, a little knowledge and common sense can go a long way, providing you restrain your wilder urges. Rob Pickering's book *DTP at a Glance* tries to provide a little of that knowledge, and also tries to illuminate the jargon used in the black art of design.

The book is in three sections; loosely, jargon, layout ideas and production. Part one is a thorough explanation of typefaces, point sizes, leading and so on. Basic stuff but vital, and it's well set out.

Part two is meatier, giving you reasons why things are done the way they are. Rightly, it emphasises margins and balance – too many first-timers leave little space at the edge of the page. Part three starts off with a description of the various printers you could use, contrasting dot-matrix and laser output, and then gives strong advice on photocopying, printing and binding.

The book is a good buy for publishing tyros: a slim volume, easy to read and pitched at a low level. There are any number of others just like it, notably John Miles' *Design for Desktop Publishing*, but Rob Pickering's book is as good as any.

It's bundled with Computer Concepts' *Impression* for just this reason. However, I don't think *DTP at a Glance* would be such a good buy as your second book on DTP, and it wouldn't be of great use if you were looking for inspiration for page layout.

Graham Bell

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GAME SHOW



Interdictor II: faster, bigger and smarter

Yes, he's back. After a short break, one of the greatest names in the Acorn games world is back on the scene. Someone who has been in from the start, and made his name through determination and skill. Who? Why, Gary Partis of course (who did you think I meant?). Gary quit the Acorn games scene a few years back for fear that his 'magic' would wear off and mar a good reputation. (Something like 'quit while the going's good' – the sort of philosophy a gambling friend of mine called Mehmet would do well to remember.) Gary is involved with a number of projects and the first is the Archimedes version of *Hostages*, which should get a small review next month.

A quick tip for playing level seven (password 'electron') of *Quazer* from Reza Jugon of Wembley: shoot all but two of the ships at the top and they'll begin to feel a little insecure and stop shooting at you!

Exile help is on its way. Almost two

years after its launch the little green man has baffled the best of you. Fewer than 10 have cranked the old spaceship into gear and flown off, a victorious hero of glory, back home to fame and fortune (an in-joke shared by the nine or so wry Mike Finns who have completed the game). Thank you to all who have written in begging and threatening and, incidentally, flattery – you should be told – will get you nowhere, (though money might!). I'm sure a special *Exile* Game Show can and will be arranged soon. Watch this space.

Orlando's three-dimensional pool game in which the innovative player operates the table as opposed to the cue will shortly be available from a leading BBC micro games company. The Beeb and Elk versions found themselves at number one in my Top Five of last year and soon the game, with the Archimedes version also, will get a long awaited airing in the Acorn market place.

To my mind *Interdictor* from Clares was a good game apart from the frustrating

'barenness' of the ground and could have done with more airfields. But soon, in a bid to amend these faults, *Interdictor II* will hit the shelves. Clares is claiming that the improvements are the result of comments from reviewers, and since *BBC Acorn User* was virtually the only publication to criticise the original at all – well, just thought I'd mention it.

The scenario has been squared off into an area of 10,000 square kilometers, instead of the long valley which features in the original version.

There are more clusters of hills, which look like hills and not pyramids, irregular shaped lakes, and train routes too! Villages contain houses, shops and churches, and one of the many missions is to wipe out enemy invasions of such places by intercepting their bombing runs.

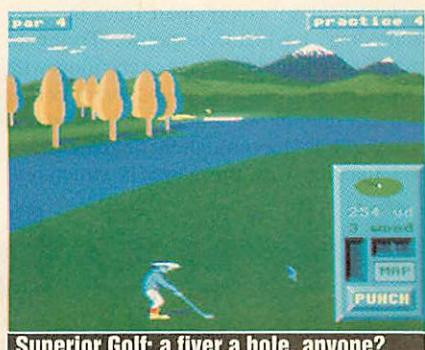
There is a broader range of aircraft too, with bombers, jets and cargo planes. The latter drop trucks full of supplies under parachutes, but they get down faster with a little help from your rocket launcher! The most interesting feature, I think, is the application of an expert system which is being used to operate the enemy, making it in effect more 'intelligent'. All enemy tactics are simulated with a long set of rules, so it won't try the same ideas time after time.

The programmers also claim to have improved on speed and the sequel sells for £34.95 – no change from the original. *Interdictor II* will make its first public flight at the *BBC Acorn User* show in September, where the enhancements will be displayed on a large video screen.

Finally, Superior Software has released a two-in-one golf game and course designer for the Archimedes. In features and play, it's comparable to US Gold's *Leaderboard*, though neither this nor the reigning golf champion *Holed Out* has a built-in hole editor. *Superior Golf* is available now for £19.95, though you'll have to wait a month for the review.

Thanks to Rob Miller for babysitting during the past two months; you're stuck with me from now on. Any hints, cheats, or intelligent comments – you know where to send them.

Sam Greenhill



Superior Golf: a fiver a hole, anyone?



SAS man impersonating an orang-utan

Hostages

Superior Software, tel: (0652) 58585, BBC Cassette £9.95 Disc £11.95, Compact £14.95, Electron £9.95, Arc £19.95
The background to *Hostages* is basic stuff. Some naughty terrorists have invaded an embassy and taken some hostages. As head of the anti-tactics annihilation squad, it is part of your mission to rescue them, but your main aim is to do a lot of destroying and killing. The game is split over three levels. On the first you guide three men to different sniper positions in buildings opposite the embassy. This entails running along the pavement ducking and diving to avoid the beam of a searching spotlight. If it falls across your man he may briefly hear the crack of a rifle before discovering that he can't hear anything else.

Niggle one: if I see him sprawl across the pavement it is clear that he's dead, and a long message to inform me of such is really tedious. Apart from that and the occasionally slow keyboard response, level one passes without fault.

Once in position, the snipers can shoot out all the windows in the embassy, and if a terrorist is in view shoot him at the same time – too bad if a hostage gets in the way. Stupid fool, I say. Extra men are airlifted onto the roof and then, with the protection of the marksmen, begin to abseil down the side of the building to swing through the windows.

Level two is my favourite, because a fair amount of skill is necessary to get all three men inside the building. Once inside, it's a case of shoot anything that moves.

Level three is okay apart from the very annoying keyboard response. Trying to manoeuvre round the maze or corridors with armed psychos lurking round every corner is tricky enough without the quarter second delay in rotating through 90 degrees.

I like the way the game is structured.

Apart from there being three sub-games you must complete them all three times with increasing difficulty, thus catering for mixed ability players.

The graphics in *Hostages* are certainly adequate, though the sound is a bit hollow. But I found it enjoyable and addictive, and though it isn't as fantastic as the screenshots may suggest, I would buy it.

Sam Greenhill

E-Type

Fourth Dimension, tel: (0742) 700661, BBC/Electron Cassette £9.95, BBC Disc £14.95, Compact £15.95, Arc £19.95

In the April 1988 issue of *BBC Acorn User* Beeb gamesters' hopes were raised at the prospect of a BBC version of *Zarch* – then dashed in May when the most trusting of them discovered it was an April fool joke, (and I of all people fell for it!). Well, BBC *E-Type* isn't a joke, and I'd like to take this opportunity to grin at all those who laughed at me in 1988 and who also thought this latest one was a farce too!

Eight-bit *E-Type* is actually a very commendable piece of work. Perhaps the blurb on the inlay card does go slightly over the top by indicating that it's *better* than the Arc version, but author Gordon Key has



certainly done justice to the game, not least with the graphics.

There's not much to describe. You ought to be fully aware that driving games involve little else but driving, and the most proficient of you will have realised that the name implies little else but reckless driving. But where the Arc version stops here *Beeb-Type* cruises on, for the job of collecting time bonuses, boring menial task, has been 'enhanced'! In order to slam brakes on that clock now you must sort-of-accidentally 'slip' and 'bump' into innocent bobbies. Try to forget they may have families, sniff, kids, sniff, a small dog, sniff, a killer Alsatian, (whoops) and hear them squeal as you smash your 5.3 litre 12-cylinder V12 beauty right where it hurts the most (ouch!). As they buckle and die, your sadistic computer awards a

healthy time bonus as reward. Who's entertaining who? I found *Beeb-Type*'s semi-automatic gearbox better than the Archimedes', which is only manual or automatic. It introduces skill without compelling the average player to have six fingers on each hand.

On the down side, the five backdrops are remarkably similar, ranging from the green coloured hills of the Broads to the yellow coloured hills of the desert – there isn't much variety.

Also, the longer tracks begin to repeat themselves every few miles, and familiarity breeds contempt rather quickly.

The screen can become cluttered sometimes, making it difficult to drive, but on the whole *Beeb-Type* gets the thumbs up from me. Nice one Gordon.

Sam Greenhill

Manchester United Football

Krysalis / Teque Developments, tel: (0709) 372290, Archimedes/A3000 £24.95

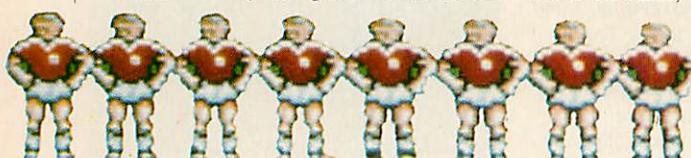
One of the companies tentatively dipping a toe into Archimedes games waters is Krysalis, which has produced a highly enjoyable and detailed football simulation, the best I can recall on any machine. With the World Cup invading our TV screens I should imagine this football game will be on most Arc owners' monitors as well before long.

Here we have a full management simulation of a modern football club, with all its trials and tribulations and an excellent arcade style soccer game into the bargain. Two discs, one for each of these two contrasting but interdependent views of football, are supplied.

The management section of the game is as comprehensive as you are likely to find anywhere and is presented in the form of a menu system, with large animated 'icons' and digitised footballing pictures in the background. From this main menu, which is accompanied by better than average music (complete with football chants) you can examine and change almost any aspect of running the club.

As team manager, you can see each team-member's form, broken down into its various component parts which include tackling, shooting, confidence and passing abilities, and you can even look at their photographs. Player transfers are well dealt with, and you can buy or scout for players on the transfers list. The graphics are particularly good here when your unwanted player leaves with his boots tied around his neck, or another team's manager appears with a suitcase full of money!

If you select the progress report option, a copy of the *Manchester Daily Sport* is shown, the headline of which shows how you're doing in your new profession. Also



shown are the first three teams on the current league table, covered in more detail in a separate section where it is possible to alter the upcoming fixtures, and even the names of the teams. Your lads are kept in trim by regular (and selective) training in each of the seven football 'disciplines'; passing, tackling, marking and so on. Every member is given a proficiency rating in each of the areas, along with an overall mark based on these.

Also shown on this main screen are lists of players currently under suspension or injured, and yet more menus are available



Spot the balls-up...

to select disc operations (successful teams can be saved/loaded at will) or to set the game preferences (game time, and key definitions for example). Once you've bought your players and supervised their training, you are finally in a position to actually play a football match.

Alternatively, you can simply skip the administration section and get straight on with some real football. One small drawback with this is that since you take the role of one team, two player games are out of the question as far as I can see.

The action side of the game will be a difficult act to follow for future football releases. Instead of the more conventional overhead view of the pitch, you are provided with a novel perspective, as if you were sitting high up in a grandstand of the stadium. The screen is in overscan mode, which means it uses for graphics the area normally taken up by borders.

As the players move around the grass the picture scrolls faultlessly, revealing new sections of detailed crowd graphics and new areas of pitch. The latter is realistically worn and muddy in places and not a uniform baize-green as in some soccer games I could mention. The enlarged screen area really gives a sense of 'being there', or watching the match on TV, and even the corner flags blow about in the breeze. The screen dramatically fades up from black to reveal graphics which have a distinct ST-ness about them. However, they're perfectly good, and using that machine's graphics has in no way spoilt the Arc version.

Sound effects have been kept to a bare

minimum, just ball-booting noises and unintelligible grunts from the players, and a prolonged roar of the crowd in the background.

The latter becomes downright irritating after a while and is impossible to turn off, once play has commenced. The motion of the players is smooth and convincing, but it struck me as being odd when somebody moving slowly (often the ref) had his legs going 15 to the dozen! Ball control is very good indeed, and it is easy to pass accurately or administer a sliding tackle.

Both teams' goal-keepers are computer controlled, and their respective skill levels are adjustable from the menu. When a ball happens to slip past one of them a screen appears saying 'GOAL!', which displays a sort of action replay (a few coarse frames of real video).

Both teams' scores and the game time remaining flash intermittently at the top and bottom of the screen – this is not easy to read and can be distracting. The player currently under your control is well indicated by a sort of maltese cross at his feet, and there is a map in the top left corner showing everybody's whereabouts.

There is a hint embedded in the game which makes me think that, happily, there may be more delights on the way from this source. Manchester is currently just about the 'hippest' place in the country to be, and its standing should be improved even further by this excellent piece of software.

Mat Tizard

Play it Again Sam XIII

Superior Software, tel: (0652) 58585, BBC/Electron Cassette, £9.95 Disc £11.95, Compact £14.95

Has it ever struck you that one day Superior Software is going to run out of titles to put on its compilations? That day is drawing closer, but judging from the variety of this current offering, it is still at least a few months off. Here, we are presented with four games – *Barbarian II*, *Percy Penguin*, *Pandemonium* and *Hyperball*; all but the last of which have been scrutinised at some point before in these columns.

Instead of re-covering old ground, I'll turn to *Hyperball*, not really a 'new' game, but actually the latest in a long line of *Breakout* clones. I can't help wondering if, after *Arkanoid*, *Impact* and *Krakout*, the market for such games might perhaps be saturated?

All the best features of those games are here, bar a screen designer, but this shouldn't be held against *Hyperball*, for it



contains several neat variations on the old theme, such as an innocent-looking bonus-shaped package that falls from above, only to knock a large hole in your bat! There are six 'Arenas', each containing 20 screens which can be loaded

at will and played selectively (provided that you've completed them before). The front end of this game is more than a little spartan, with only the compulsory scrolling message, written in a headache-inducing font, to catch the eye.

An unfortunate detraction from the gameplay is the length of time that your bat takes to appear at the start of each level. A very pretty, but lengthy and irritating, animation is replayed upon each launch of the ball. This is partially made up for by the pleasant dissolving effect when you lose.

The stylish scoreboard with its large chunky digits is very impressive and it means you don't have to squint into the corner of the screen.

All the familiar 'tokens' drop from the bricks as you destroy them and have more or less the usual effects: eight-ball splits, disclosure of invisible bricks, sticky bat, laser, jump-level and so on.



Hyperball: anyone for Breakout?

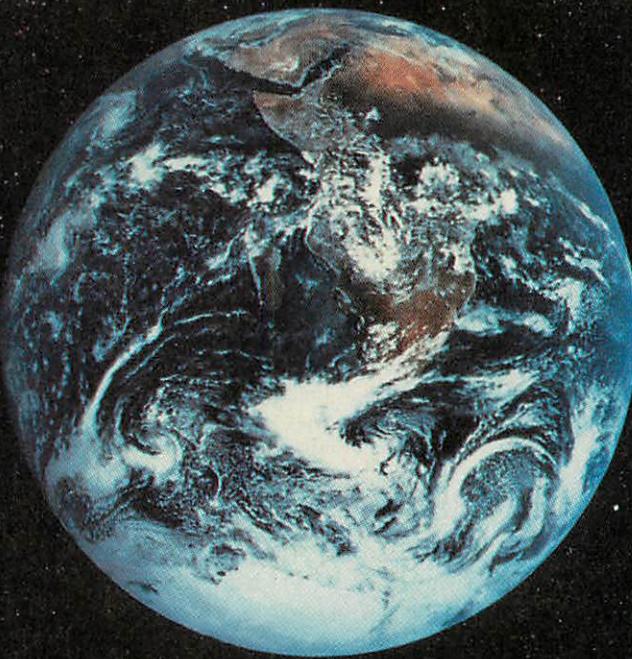
You are able to buy upgrades for your bat with the credits which you win while playing. These range from a 'Quantum Energi' to a 'Life Regeneration' capsule.

Although this game comes across as being a space filler for the compilation, its originality and grand total of 120 screens make it good value for one of four games. The best version of *Breakout* ever it is not, but it isn't bad either.

The other components of the compilation – *Barbarian II* with its large and jerky sprites, *Percy Penguin* pushing ice-blocks onto his blancmange-shaped adversaries and Peter Scott's classic arcade adventure *Pandemonium*, combine to make what will doubtless be another money-spinner for Superior. But I get the worrying feeling that, after so many compilations, unless Sam starts to play another tune, in 2020 we will all be playing *PIAS Volume 137*.

Mat Tizard

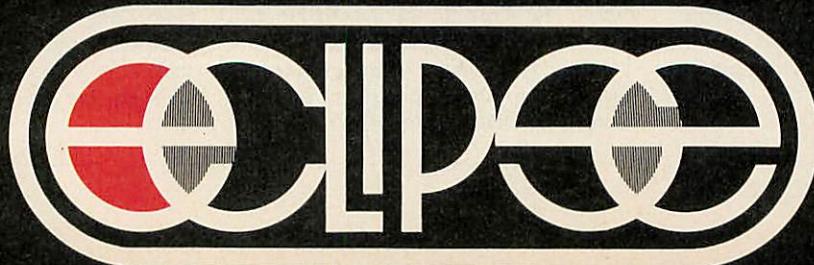
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ALPINE ADVENTURE

Text adventures are perennially popular games for Acorn owners. **FIN FAHEY** explores ALPS, an Arc adventure designer that

It amazes me how, in a market as fickle as the games world, the traditional text adventure lives on. Rumours of the demise of text adventuring have come in thick and fast from the 16-bit games scene, where the big thing is the RPG (for Hostages-playing Rambos this means Role-Playing Game, not Rocket-Propelled Grenade).

But it always turns out that reports of the old-timer's death are exaggerated. Level 9 and Magnetic Scrolls still maintain a respectable niche in the 16-bit market with their good-humoured, slightly off-the-wall adventures. It's interesting that these two are the only major (meaning global – sorry, Little Englanders) software houses to show any real commitment to the Archimedes.

So the *ALPS* adventure designer from Alpine Software, which might seem like a throwback in the 16-bit market, may get a warm welcome from 32-biters. The original *ALPS* (*Adventure Language Programming System*) ran on eight-bit Beebs, being the equivalent of the C64/Spectrum's *Quill* or *Graphic Adventure Creator*.

Upgraded for greater ease of use, the 32-bit *ALPS* aims to be a complete text game designer. Users can assemble their own text adventures and even market them as stand-alone packages, provided they put an *ALPS* acknowledgement on the title screen.

Open box and remove disk

The package has two aspects. Firstly, it goes out of its way to simplify the process of creating the data and textual matter you need to flesh out a full-scale adventure. The highly conventional nature of adventures helps with this. Secondly, once you have set up your data, it can be manipulated using a formalised sub-set of Basic.

Adventures usually boil down to moving a lot of objects around a lot of rooms in a particular order. This is no condemnation of the genre – it's just like saying that all Raymond Chandler novels are about disgruntled Californian gumshoes. True, but it's what you achieve within the limitations that counts. In this case, setting up the rooms and objects is simple. By clicking on the

door and key icons, you are presented with the room and object editors respectively.

The room editor allows you to connect rooms by specifying room numbers for each of the exits. Up to 255 rooms are supported, while room 1 is not available, being the player's pockets (Inventory...) and room 0 is a null area into which you can make objects disappear.

Extra information can be specified for each room, such as flags meaning the room is dark, airless, or any other property you want. A pointer to a message describing the room is also present. Each of the exits can be specified as having properties too – they can be locked, open, invisible or whatever.

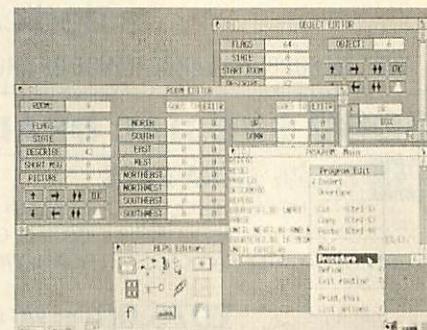
Objects too have their own designer box. Each object can be specified by two words, noun and adjective. The noun can be made to refer to a number of different objects so that, say, while objects 1, 2 and 3 are all keys, 1 is referred to as RUSTY KEY, 2 as GOLDEN KEY and so on. To enter these words in, you need to use the Vocabulary editor, which feeds directly into the parser.

The core of any adventure is the parser. *ALPS*' parser is reasonably advanced and can recognise sentences like: THROW EVERYTHING BUT THE MELON AND THE HAMSTER INTO THE TIME MACHINE THEN SHOOT THE PIANO PLAYER AND GO SOUTH. Each of the parts of speech can be modified and added to by the player. So, in the Vocabulary editor, there are sections for conjunctions, prepositions, 'noise words' (such as articles – to be ignored) and so on.

The other aspect of language is the ability to set up 'messages'. A message is the output you get when you take some action, look around or whatever. Each message is set up using a fairly comprehensive text editor, and each has a number. That number is then used to key the message to something else such as an object, room or action, so a message could be a room description or the result of an action.

Read manual

Assuming that you've set up all your data, the next problem is to tie it all together into



Windows let you design interactively

a game. This is the part that non-programmers may find a little intimidating. The adventure language used is a very formalised set of Basic procedures.

The process is simplified because Alpine has included a skeleton starter game to get you going. However it is important to keep careful track of your room and object data – everything is referred to by its number, not by name – and some slight grasp of programming is helpful.

The game can be tested by playing it at any time. *ALPS* games are very friendly to play indeed (see our review of Alpine's own game *Cops* in the last issue) because they make any text visible on the screen available to the player, so you can construct whole sentences by simply clicking on words in descriptions or commands. In addition, you can also drive the game with a series of icons at the base of the screen.

Inventory

I'm moderately impressed by *ALPS*. It contains just about all you need to put together quite advanced adventures, almost up to the Level 9/Magnetic Scrolls level. Alpine has even included a facility for importing graphics from another package, wisely deciding that since everyone has *Paint* there's no point in including a dedicated utility.

The only thing missing that might bring an *ALPS* game up to professional level is text and graphics compression/decompression. This is what made Level 9's name originally, since it made it possible to get a 64K game into a 32K machine. Alpine is promising, though, to produce an extension disc with this facility, among other things.

Criticisms? Well, it could have been a tad friendlier. Since everything is cross-referenced by numbers, it's easy to get lost.

It could also have exploited the graphics potential of the Arc better by allowing the user to display or print a map of their adventure world.

Nevertheless *ALPS* almost succeeded in reawakening my long-suppressed urge to design a set of those good old catacombs.

ALPS, Alpine Software, PO Box 25, Portadown, Craigavon BT63 5UT Tel: (0762) 342510. Price: £33

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NETWORK SERVERS

CHRISTINA NEAL discovers how British Rail is keeping commuters informed, with the aid of a few Beebs



Even though British Rail sports the infamous 'We're getting there' slogan, it's the first to admit that, when trains can't get 'there' on time, information concerning delays isn't always available. Admittedly, most main stations are swift to make apologetic announcements, and also have plenty of staff onhand for yelling at! But smaller, remote country stations are a different matter.

'Many country stations are unstaffed, especially in the evenings', says BR's regional investments manager, Gerald Daniels. 'So anyone waiting for their partner after work has no way of knowing when they will be arriving.'

Apart from being an obvious source of family rows, the situation does little to improve BR's already shaky reputation. So when a firm called BLISS (Booking Lane Information Systems Services) produced a computerised system for relaying information, Daniels was impressed.

'I know a bit about computers as a user and I'm interested in modern technology so, although it didn't run on a PC or have a hard disc, I could tell that it was menu-driven, user friendly and foolproof', he says.

The system - comprised of a Master network - was devised by Bob Brennand, a former long-term employee of Midland

Bank's computer division. Although he formed BLISS with the sole intention of producing it, he knew that there were promising rival products on the market. At the same time, he felt that they were too costly and therefore unprofitable for British Rail.

'There have been a large number of gold-plated products which have been very sophisticated and very good', he says. 'But for small, outer-suburban stations, they have been out of reach in terms of being cost-effective. That was the hole that BLISS filled. I wanted to provide a modern system at a good price and with lots of advice and interest from BR, I was able to do so'.

The BLISS system is currently being used at various stations nationwide, including Shipley in West Yorkshire, Telford Central and Ashford in Kent. An emergency version was installed on the Salisbury line in a few days after a previous system crashed.

However, it has proved particularly useful on the Ashford line where small country stations with little or no staff are commonplace. Bob explains how it works:

'The Ashford line has 17 stations, all equipped with Master computers, with an Archimedes 310 in the Ashford signal box. The Arc is the controlling machine where the base of information stems from.'

The Arc sends messages to the other stations via a Tandata modem which dials up

the Masters in turn. This enables messages to be displayed at every station on the line, regardless of whether they are staffed or not. The Masters are also self-supporting and can be used as standalone machines.

'The Masters can be used in their right', says Bob. 'This means that if the Arc goes down, they can still be used to display information - they just won't have that link with the other stations.'

'We used mainly Masters because, when I started developing the system, the Arc was an unproven machine. Also, the Master was very sensibly priced.'

Another plus for using the Master is its reliability and sturdiness - qualities that Brennand and Daniels will both vouch for.

'Bear in mind that people using the machines are not trained computer staff,' says Bob. 'They may have come in from off-loading a parcel train, but the Master is a strong, rugged machine capable of withstanding the dust and muck.'

'The system has never failed,' says Daniels. 'It's very reliable. We recently had our first case of vandalism where someone threw a sledgehammer at the screen, but it still hasn't let us down.'

I deliberately tried to crash it by doing everything you shouldn't do, but it's virtually idiotproof! It tells you when it won't do something rather than crashing!'

It all sounds easy to use. The clerk has plenty of time to select the line of route, type of message and the four-digit train number. It's all based around the four-digit number that BR carries in the signalling system - something that the staff are obviously very familiar with.'

It all sounds very detailed, but is there anything that Daniels would like to see added to the system?

'Well, we recently added remote control software, which is very useful, and the software is presently being adjusted so that a four-line screen will come up and enable staff to type in the reason for a delay. So rather than just say that the 15:01 has been delayed, they can say it has been held up at 'X' due to a body on the line. That way, people won't get so annoyed!'

Although Daniels is clearly very confident in the system, he is reluctant to say whether it will be extended to cover the entire British Rail network.

'It's early days yet so I'll answer that question by not answering it,' he says. All I can say is that the system can go to any station you care to select and it really is very flexible. It's also competitively priced, although I wouldn't call it cheap and cheerful. I think it's cheap but sophisticated.'

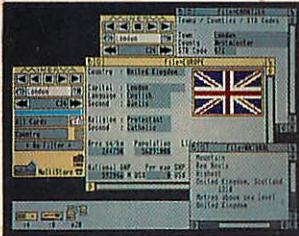
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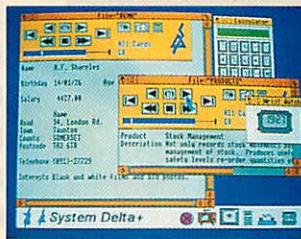


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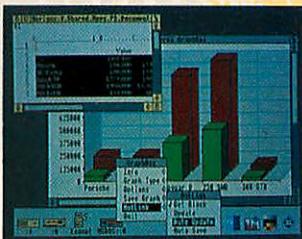


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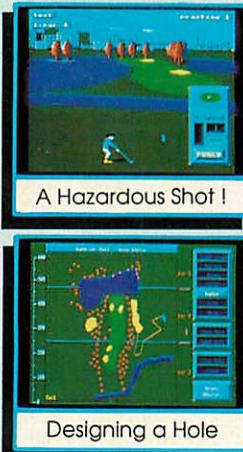
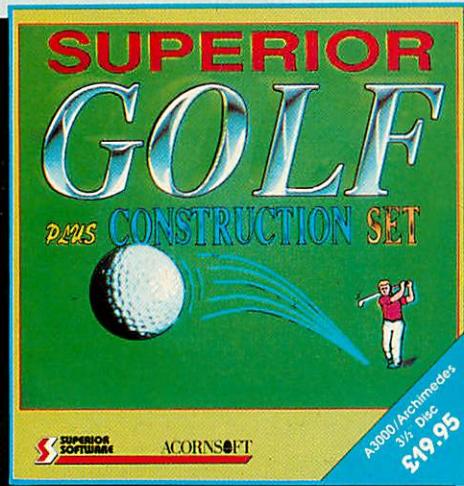
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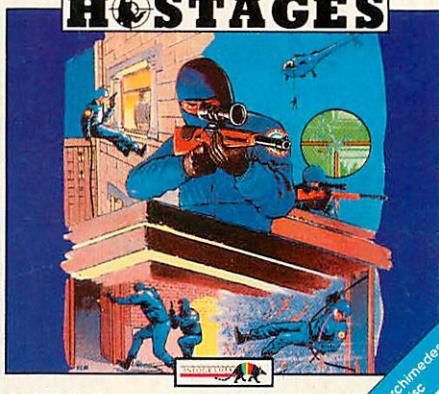
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